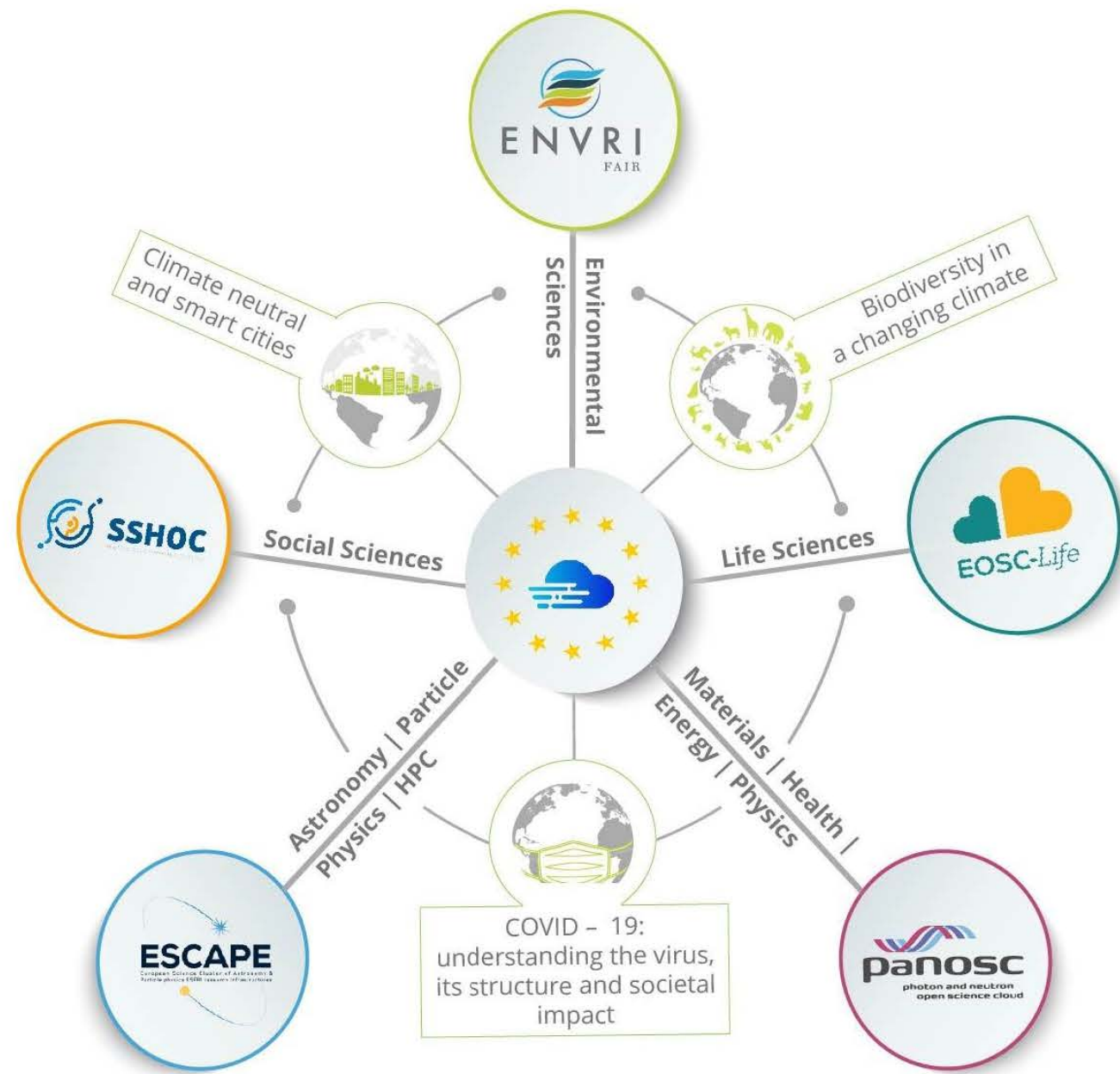# ESFRI Science Clusters' Long Term Commitments to Open Science

11 June 2021

ESFRI Science Clusters' Long Term Commitments to Open Science - 11 June 2021
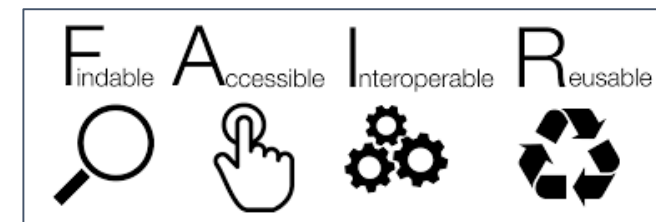
The Science Clusters

Science Clusters of Research Infrastructures (RIs) proposed in 2018 in response to the dedicated H2020 call

Five Science Clusters to ensure the connection of the ESFRI RIs with European Open Science Cloud (EOSC)

Expected impact:

- *Improve access to data and tools leading to new insights and innovation*

- *Facilitate access of researchers to data and resources for data driven science.*

- *Create a cross-border open innovation environment.*

- *Rise the efficiency and productivity of researchers through open data services and infrastructures for discovering, accessing, and reusing data.*

- *Foster the establishment of global standards.*

- *Develop synergies and complementarity between involved research infrastructures.*

- *Adopt common approaches to the data management for economies of scale.*

Working together making data FAIR …

An important path of cooperation and synergies

- A natural and reinforced collaboration among the ESFRI RIs' management boards in each Science Cluster.

- From dialog to a structural cooperation among Science Clusters Boards.

- Starting up inter-cluster synergies and bridging on technologies.

- Continuous synergies with EC, ESFRI-EOSC task force and EOSC Secretariat

- Science Clusters as an integral part of EOSC:
    - interpreting and guiding the thematic implementation of EOSC concept;
    - their outcomes are now forming the core of the emerging EOSC fabric;
    - essential and key role for the science-content and science-goal of EOSC;
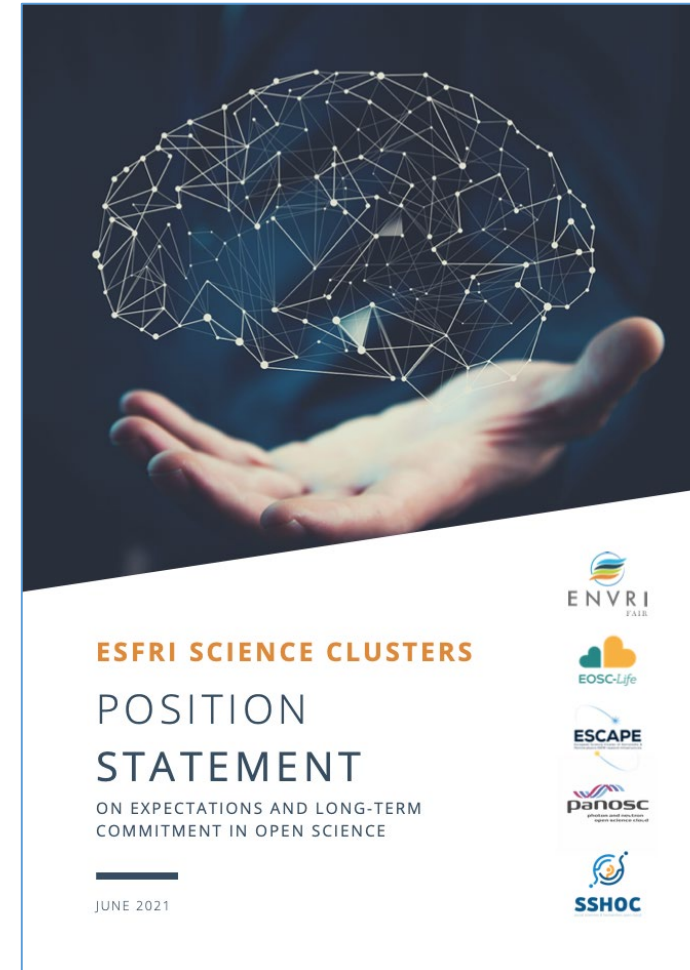   - gathering together their concerned scientific communities.

Five thematic Science Clusters

More than 80% of ESFRI RIs, plus other world-class RIs and new emerging ones.

An important path of cooperation and synergies
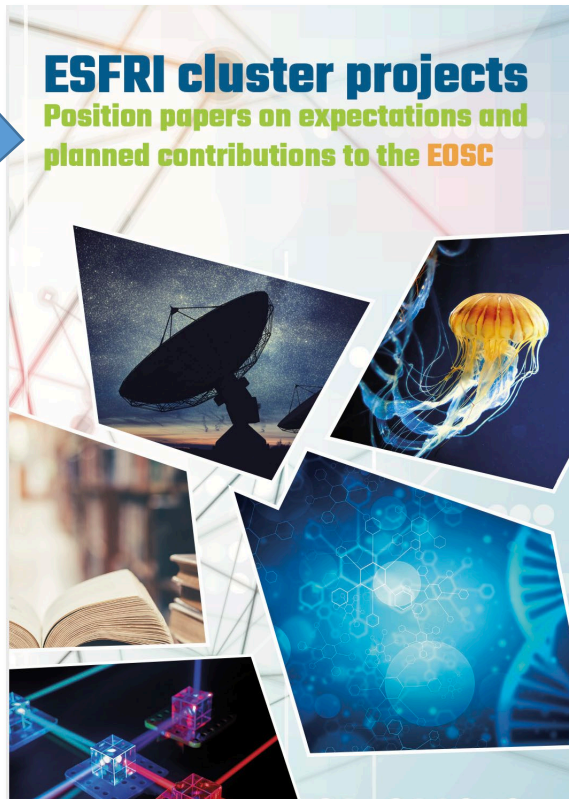
This first Science Cluster Workshop addressing an outlook for the future:

- an introduction to the programmes of the Science Clusters, their current structural value, their present and future collaboration actions;

- potential paths to consolidate the cluster work programmes and sustain EOSC;

- presenting to (and discussing with*) the European Commission, EOSC Association and ESFRI Boards a longer-term vision to support the uptake of Open Science by the global scientific community.

A dedicated (restricted) afternoon session is organized.

*By the way….. We say '**ESFRI Science Clusters**' but there are "3 distinct objects":*

ESFRI: European Strategy Forum on Research Infrastructures;

(ESFRI) RIs: A set of domain-based pan-European (in the ESFRI Roadmap) and other world-class RIs;

ESFRI Science Clusters: Current five H2020 projects supported by consortia of scientists from RIs, Universities and Institutes. *The ESFRI label recalls the commitment of ESFRI RI legal entities in the Cluster action as originally requested.*

To start with, we are happy to count on the presence of Kostas Glinos for an overview talk about Open Science, terms, ambitions and challenges in Europe.

Kostas Glinos leads the unit in charge of Open Science in the directorate general for Research & Innovation at the European Commission. Kostas Glinos holds a PhD in engineering, he has been developing EU policy and managing R&D programmes in the area of Science, Technology and Innovation (STI) since 1992.

The Science Clusters acknowledge a constant and fruitful dialog and cooperation with EC DG-RTD and DG-CNECT and especially with Kostas Glinos (et al.), producing a series of reflexions and actions, including this Workshop.
(… We learn about policies and we tell about the diversity of the scientific research world!)

1. Why we need Open Science

To make Science

- more efficient (better sharing of resources),

- more reliable and robust (better reproducibility, open scrutiny),

- more responsive to societal demands (involvement of societal actors)

- more trusted by society

Covid-19 illustrates both the necessity and success of practicing open science

2. The EC commitment to Open Science

Improve *the practice* of R&I

- Openly accessible scholarly publications

- Early sharing of all research outputs

- All data FAIR, RDM

- Reproducible results

- Societal engagement and responsibility

Develop proper *enablers*

- Rewards and incentives to adopt Open Science practices, with appropriate metrics

- Appropriate skills and education, including for research integrity

- Open Research Infrastructures including the European Open Science Cloud (EOSC)

ERA Communication

Provisions on Open Science under Horizon Europe

EOSC in the Horizon Europe RI WP

EOSC and other data strategies

European Commission

2.1 Open Science in the ERA Communication

Deepening the ERA
The Commission will: (Action 9)

- Incentivise open science practices by improving the **research assessment system**.

- Launch, via the Horizon Europe Programme, a **platform of peer-reviewed open access publishing**;

- **Analyse authors' rights** to enable sharing of publicly funded peer-reviewed articles without restriction;

- Ensure a **European Open Science Cloud** that is offering findable, accessible, interoperable and reusable research data and services (Web of FAIR); and

Citizen Engagement
The Commission will: (Action 13)

- Organise with Member States and stakeholders Europe-wide participatory **citizen science campaigns** to raise awareness and networking, crowdsourcing platforms and pan-European hackathons, in particular in the context of Horizon Europe Missions. The Commission will develop with Member States best practices to open up science and innovation to citizens and youth.

European Commission

2.2 Towards a new 'modus operandi' for Science

The dominant current system   **FROM ➔ TO**   **Open Science**

- Rewarding individual competing scientists
- Publish as much and as fast as possible
- Excellence defined largely on the basis of *where* scientists publish
- Incentivises researchers to *produce specific outputs* (mainly publications)
  - *Use of quantitative metrics*
- Increasing influence of commercial players from access to publications
  - *supported by proprietary services and analytics*

➔

- Rewarding collaboration and sharing
- Share knowledge/data as early and as openly as possible
- Composite definition of excellence
- Incentivises researchers to share, collaborate, increase quality and impact;
  - *Use of qualitative and quantitative metrics*
- Avoid lock-in over public-funded R&I output, ensuring autonomy of RPOs
  - *supported by open services, analytics and science graphs*

European Commission

2.3 Open Science under HE

Horizon Europe

- **Open Science embedded across the FP** (OA, RDM, Citizen Engagement, etc.)
  - **Evaluation** of proposals (excellence –methodology-, quality & efficiency of implementation)
  - **Grant Agreement, guidelines**
  - **Reporting**—during the project's lifetime
  - **Work programmes**
- Strengthening of the obligations with respect to open access and focus on responsible RDM in line with FAIR

→ **to foster the adoption of Open Science practices**

- providing open access to research outputs
- early and open sharing of research
- research output management
- participation in open peer-review
- measures to ensure reproducibility of research outputs
- involving all relevant knowledge actors including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science)
- …

European Commission

2.3 Open Science under HE - requirements

- OA to peer-reviewed publications under Horizon Europe
  - **deposition** in a **trusted repository** and **immediate open access**
  - **retain IPR** and **open licences** [**CC BY** (or equivalent)]
  - **publication fees** (**APCs/BPCs**) **refundable** only in **full open access** publishing venues
  - **Metadata** of deposited publications **open under CC0 or equivalent**

- OA to research data, in line with the FAIR principles
  - **Data Management Plan (DMP)** as a living document constantly updated
  - **deposit** data in a **trusted repository** (federated in EOSC if required) and link to publications
  - ensure **open access** ASAP under **CC BY** or **CC0 (or equivalent)**, unless exceptions apply
    → "as open as possible, as closed as necessary"

- OA to other research outputs (software, algorithms, protocols, workflows, models)
  - If required by the call conditions: provide digital or physical access
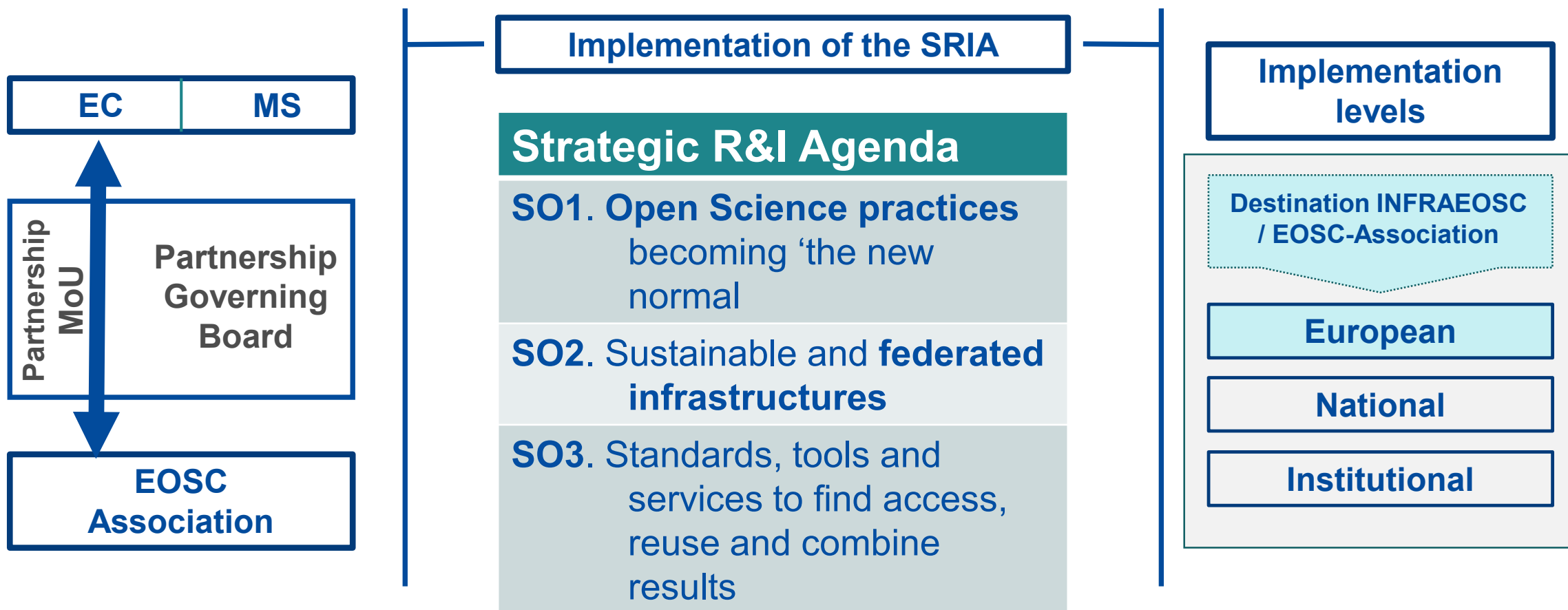 - It is recommended to include other research outputs in the DMP

2.4 EOSC in the HE Research Infrastructures WP

INFRADEV
Developing , consolidating and optimizing the European Research Infrastructures landscape

INFRASERV
Research Infrastructure services to support health research, accelerating the green and digital Transformation, and advance frontier knowledge

INFRATECH
Next generation of scientific instrumentation, tools and methods and advanced digital solutions

INFRANET
Network connectivity in research and education – enabling collaborations without boundaries

INFRAEOSC

Enabling an operational, open and FAIR, EOSC ecosystem

European Open Science Could

Enable Open Science Commons

Citizen Engagement

Open Access

International cooperation

FAIR data

Research productivity

Reproducibility of results

Infras. platforms and tools

Research integrity

Skills and Training

Rewards & Incentives

through the EOSC European Co-Programmed partnership

European Commission

2.4 EOSC in the HE Research Infrastructures WP

European Co-Programme partnership and Horizon Europe programming

EC	MS

Partnership MoU

Partnership Governing Board

EOSC Association

Implementation of the SRIA

Strategic R&I Agenda
SO1. Open Science practices becoming 'the new normal
SO2. Sustainable and **federated infrastructures**
SO3. Standards, tools and services to find access, reuse and combine results

Implementation levels

Destination INFRAEOSC / EOSC-Association

European

National

Institutional

2.4 EOSC and other data strategies

The European Data Strategy

The EU will create a single market for data by:

- Setting clear and fair rules on access and re-use of data;
- Investing in next generation standards, tools and infrastructures to store and process data;
- Joining forces in European cloud capacity;
- **Pooling European data in key sectors, with EU-wide common and interoperable data spaces;**
- Giving users rights, tools and skills to stay in full control of their data.

> "*EOSC is the basis for a science, research and innovation data space that will bring together data resulting from research and deployment programmes and will be connected and fully articulated with the sectoral data spaces.*"
> (European Data Strategy, COM(2020) 66 final)

| Health | Industrial & Manufacturing | Agriculture | Finance | Mobility | Green Deal | Energy | Public Administration | Skills |

EOSC: a crosscutting data space for Research and Innovation

3. RIs in the EOSC ecosystem

2020 ESFRI WHITE PAPER - MAKING SCIENCE HAPPEN

- RIs major promoters of Open Science providing FAIR and quality certified Open Data

- Continue to support the development of EOSC
    - increased FAIR and open data sharing
    - facilitate the cross disciplinary research and the exploitation of data interoperability
    - availability to stimulate inter-disciplinary and transdisciplinary research to achieve the societal goals

- EOSC to take full advantage of ESFRI best practices and services
    - data management, storage and curation….

RIs are major data-producers

ESFRI science clusters
ESFRI individual infrastructures

Will achievements be sustainable?

Challenge: interoperability of data and services

European Commission

3. RIs in the EOSC ecosystem

EOSC-Core

- generic services common to all

- are they common yet?
  → different AAI among RIs?

EOSC-Exchange

- generic services
- domain specific services

Access to data and services

RPOs

Federation of institutional repositories

USERS Researchers

Research Infrastructures European/National

e-Infrastructures

EOSC Exchange

Federated Data

EOSC Core

(1) RIs are providers of data and services (e.g. data services, research products..)
(2) RIs are users of data and services provided by/through EOSC
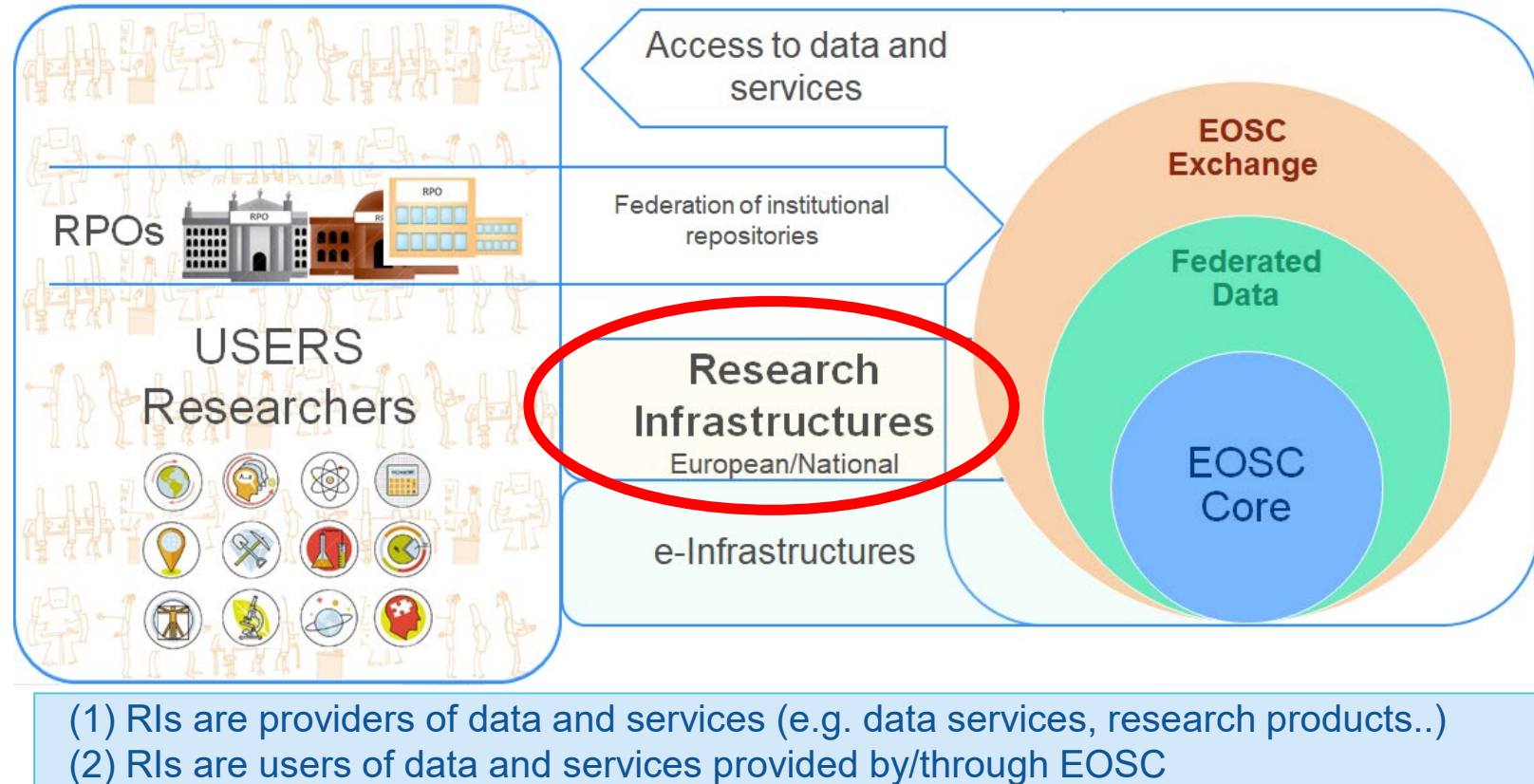
- increasing interdisciplinary research → increasing cross-domain use? → access? cost? scalability?
- services in federated environments → more access and use? → AAI? cost? scalability?
- maintenance of domain specific services → an in-kind contribution to EOSC?

Thank you

European Commission

EOSC in H2020

- 24 e-Infra prj
- 25 infraEOSC prj
- 400M€

- INFRAEOSC-04
  95 M€

Building blocks:
- AAI
- Portal
- Services
- FAIR principles impl.
- Interoperability among clusters

ENVRI-FAIR EOSC-Life ESCAPE PaNOSC SSHOC	FAIRsFAIR EOSCsecretariat	EOSC-Nordic EOSC-Pillar EOSC-synergy ExPaNDS NI4OS-Europe	COS4CLOUD CS3MESH4EOSC INODE NEANIAS TRIPLE	EOSC Enhance EOSC-Future	C-SCALE DICE EGI-ACE OpenAIRE Nexus RELIANCE
INFRAEOSC-04-2018 - Connecting ESFRI infrastructures through Cluster projects	INFRAEOSC-05-2018-2019 - Support to the EOSC Governance		INFRAEOSC-02-2019 - Prototyping new innovative services	INFRAEOSC-06-2019-2020 - Enhancing the EOSC portal INFRAEOSC-03-2020 - Integration and consolidation of the EOSC Portal	INFRAEOSC-07-2020 - Increasing the service offer of the EOSC Portal

infraEOSC

EarthServer-2 EGI-Engage EUDAT2020 INDIGO-DataCloud OpenMinTeD PhenoMeNal		**AARC2** AGINFRA PLUS HIRMEOS MSO4SC OpenAIRE-Connect OpenRiskNet	DARE DEEP-HybridDataCloud EUXDAT FREYA PPI4HPC PROCESS XDC	**EOSC-hub** OpenAIRE-Advance
EINFRA-1-2014 - Managing, preserving and computing with big research data	EINFRA-8-2014 GÉANT	EINFRA-22-2016 User driven e-infrastructure innovation	EINFRA-21-2017 - Platform-driven e-infrastructure innovation	EINFRA-12-2017 - Data and Distributed Computing e-Infrastructure for Open Science

e-Infrastructures

RDA

international cooperation

policy

Environmental research infrastructure cluster

Ari Asmi, Co-coordinator ENVRI FAIR

Andreas Petzold, Coordinator ENVRI FAIR

Characteristics of Environmental R. infrastructures

Interdisciplinarity highly relevant

Life

Air

Wide range of disciplines

Societal challenges need multidisciplinary methods

Answering societal needs is only possible via collaboration

Multiple infrastructures

High importance to society, economy and resilience

Land

Water

High level of specialization requires each RI to concentrate on their main tasks and user communities

Observations often unique - huge datasets
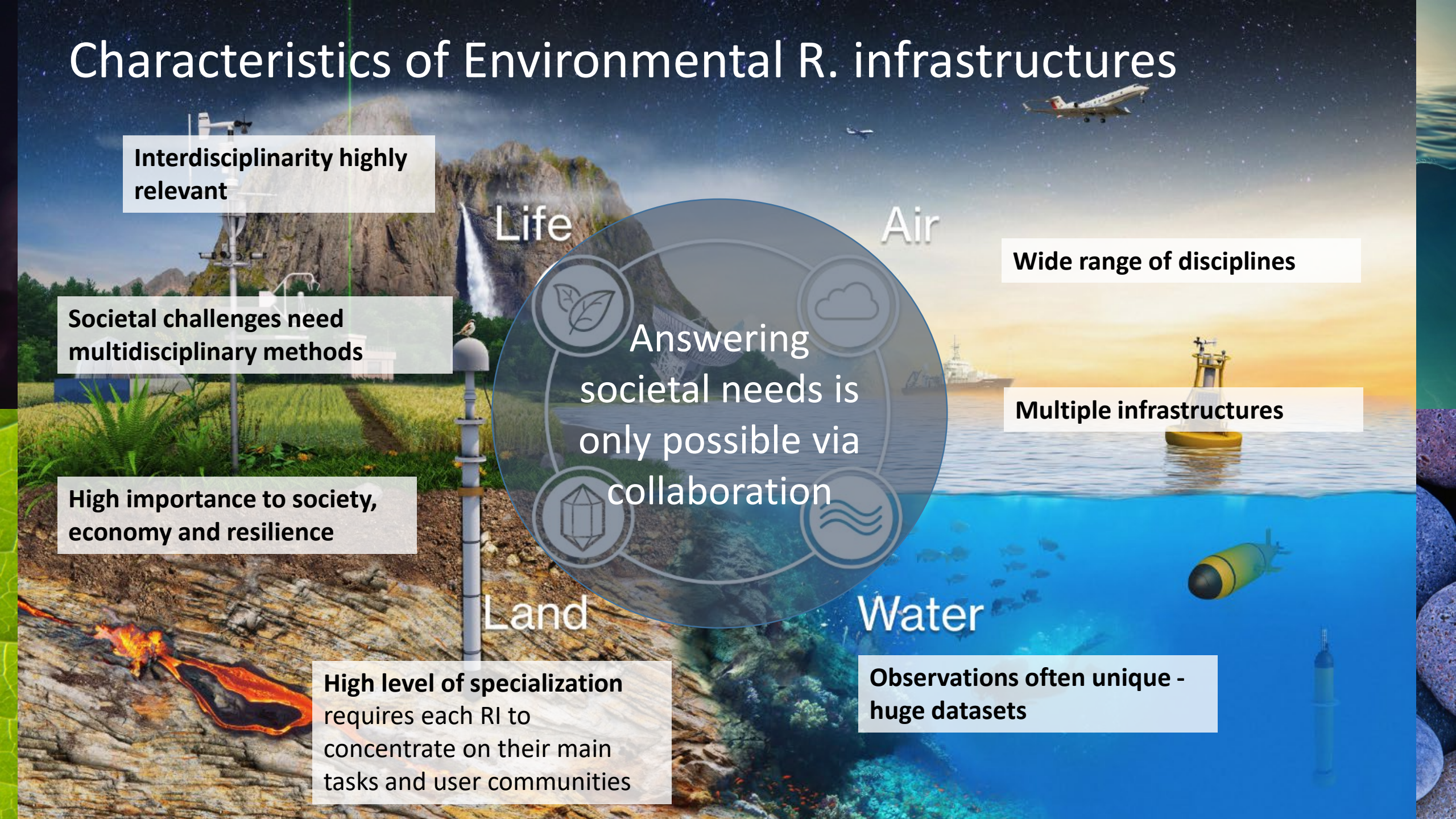
ENVRI Cluster

- ENVRI FAIR does not include all ENVRI community cluster RIs
  - Products of ENVRI FAIR are shared to all
  - All are in the strategic integration activities

- There are also many development activities for new RIs, and RI extensions underway
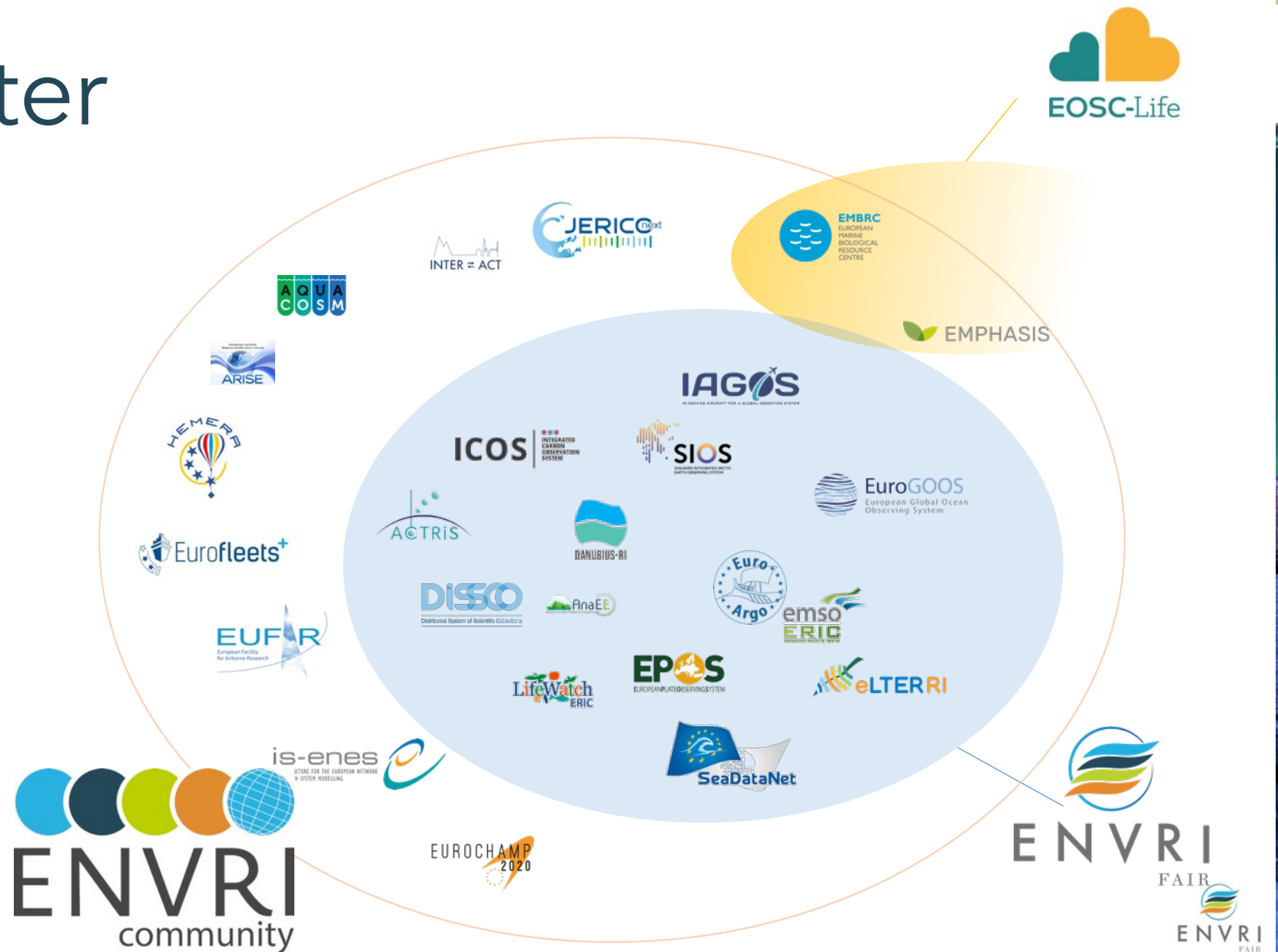
Cluster projects in ENVRI domain

2011-2014

2015-2019

2019-2023

Data service harmonization

Joint observation technologies

Societal impact enchancement

Access harmonization   (virtual, data)

Common strategic alignment, visibility & stakeholder engagement
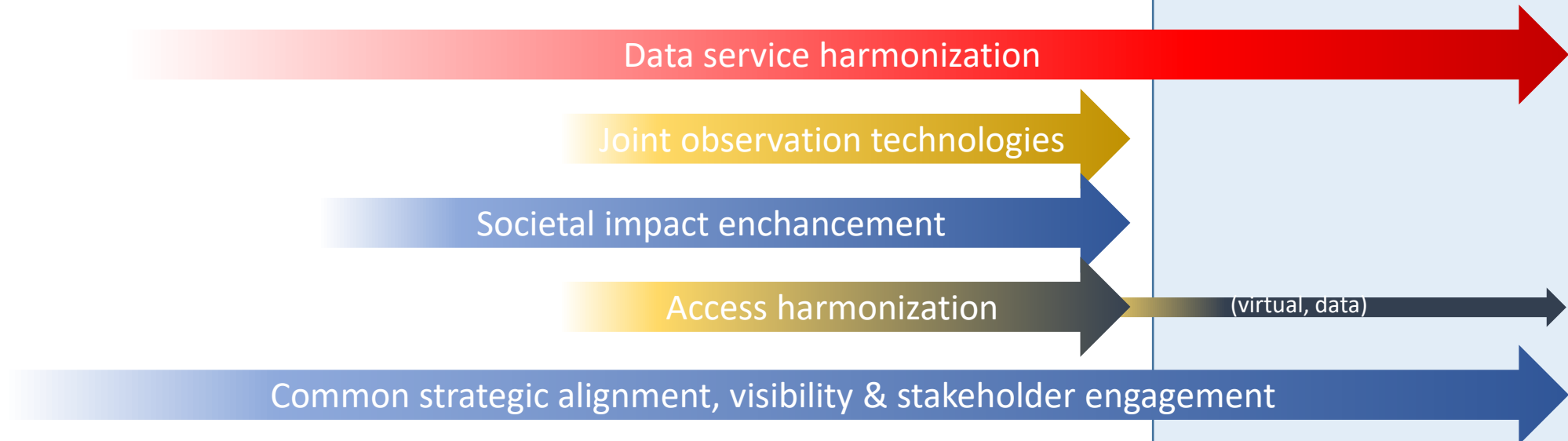
ENVRI in the landscape

Overview of ENVRI in the landscape

ESFRI RIs

OPEN SCIENCE
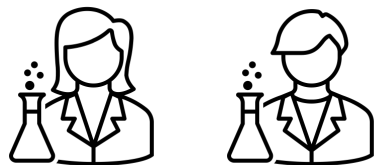
ENVRI community

SCIENCE COMMUNITIES

SOCIETY

"Overcoming barriers" metaphor

Research infrastructures

User communities

Hard to access

Not understandable

...

Hard to find
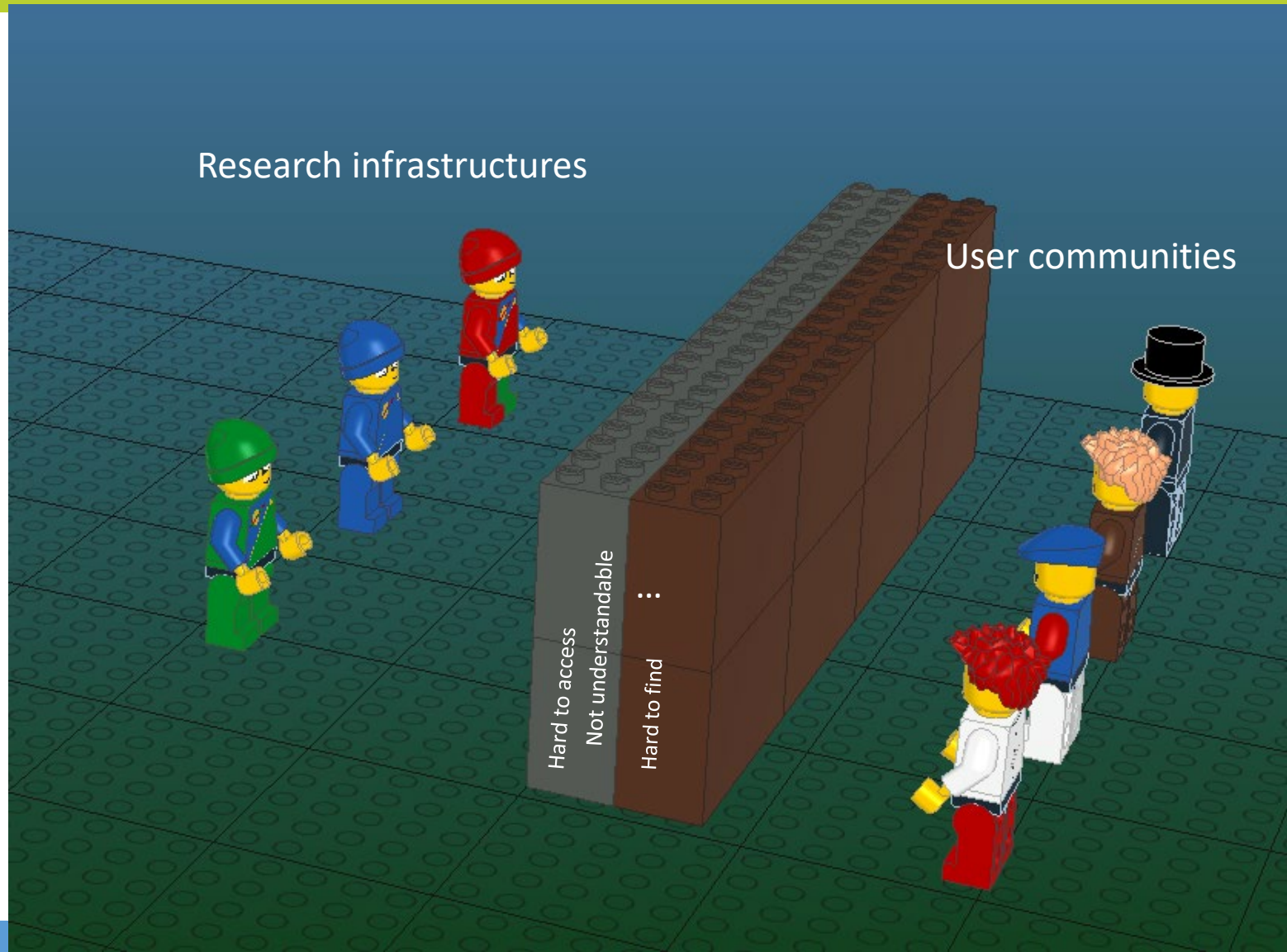
Overcoming barriers (Before ENVRIs)

Lack of use

Provision under construction

specialized provision

Specialized or ad-hoc usage
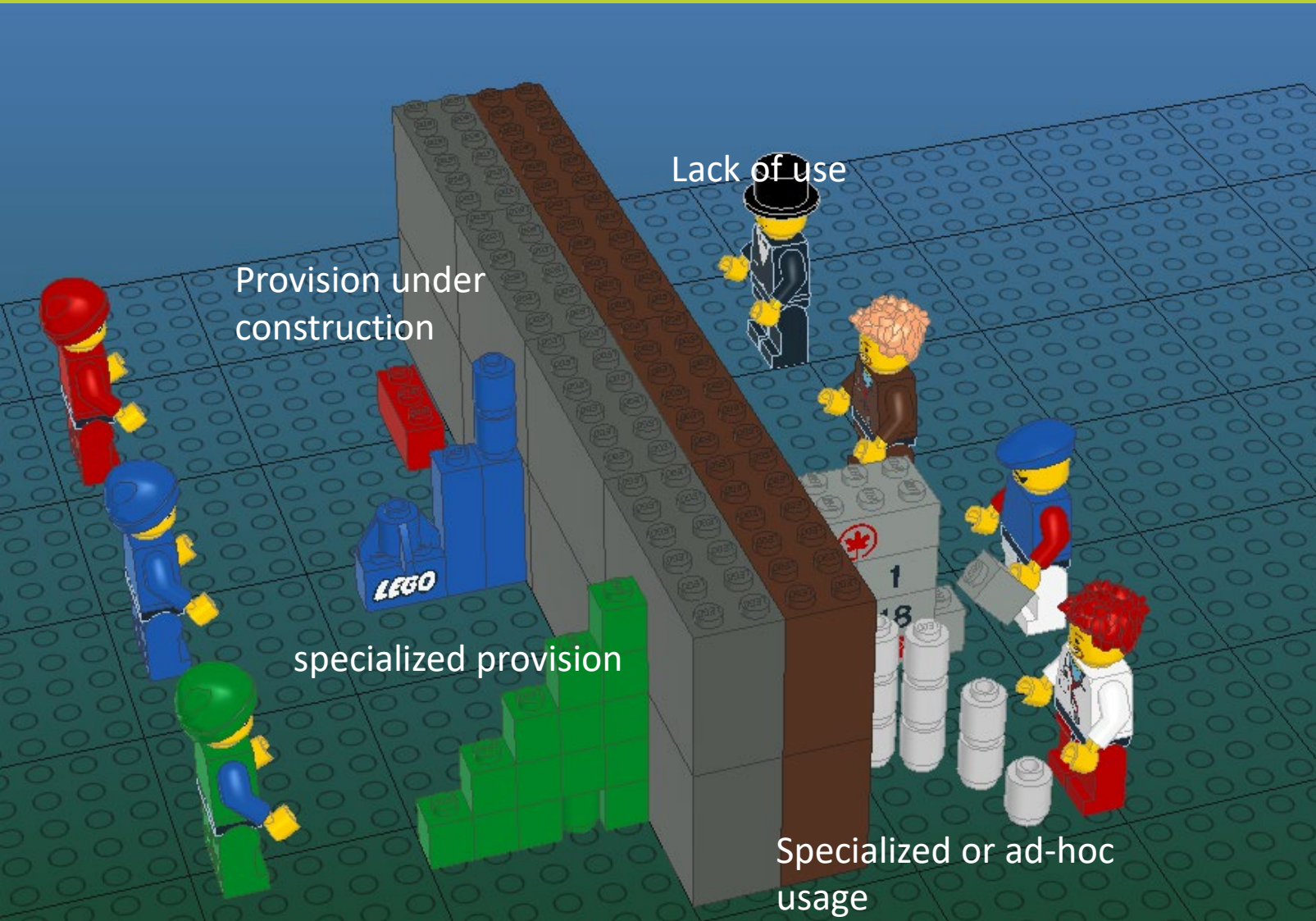
The main infrastructure mission is to provide

- **Specialized services** for
- S**pecialized users**

This is mandated by funders and solutions were often "*narrow*" in the sense of provision and usability

What has ENVRI FAIR

(and previous ENVRI projects)

achieved?

EOSC and Open science

DOMAIN HARMONIZATION

REPRESENTING ENV NEEDS &
PARTICIPATING IN DEVELOPMENT
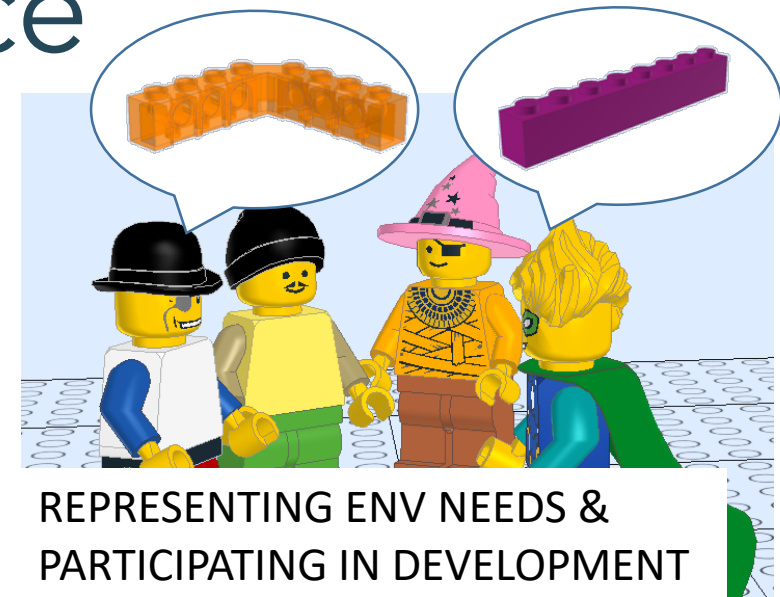
BRINGING EXISTING USER COMMUNITIES
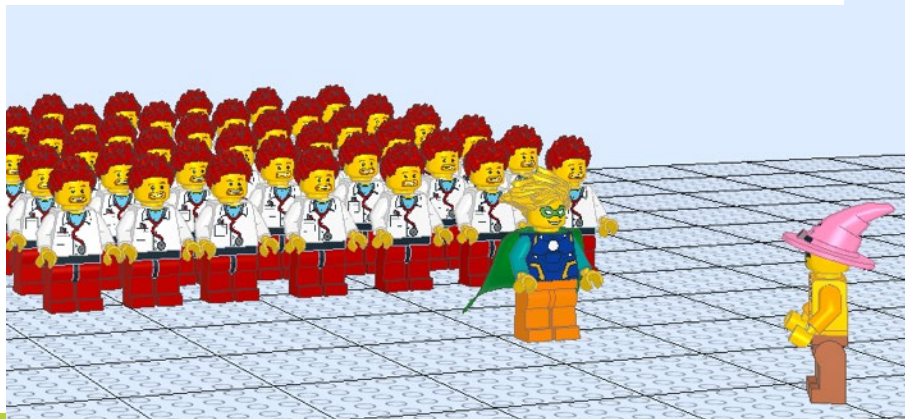
FROM GENERIC EOSC SERVICES TO SPECIFIC DOMAIN SOLUTIONS
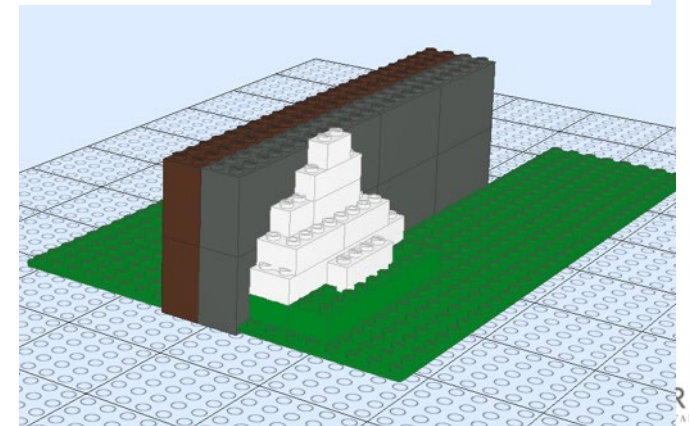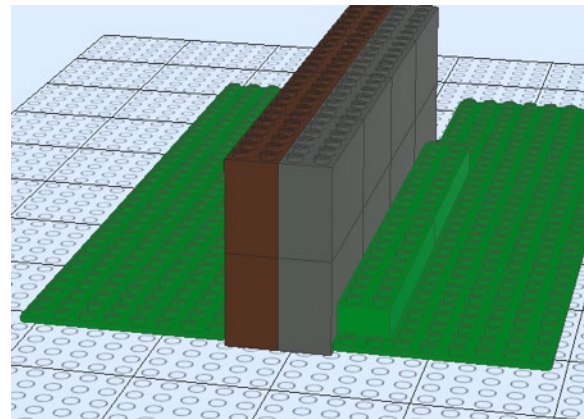
ENVRI-hub

ENVRI Community Research Infrastructures
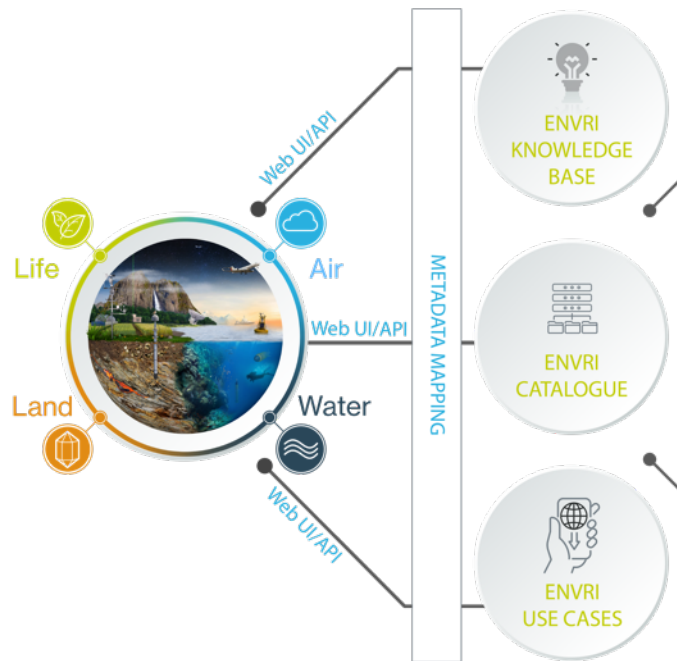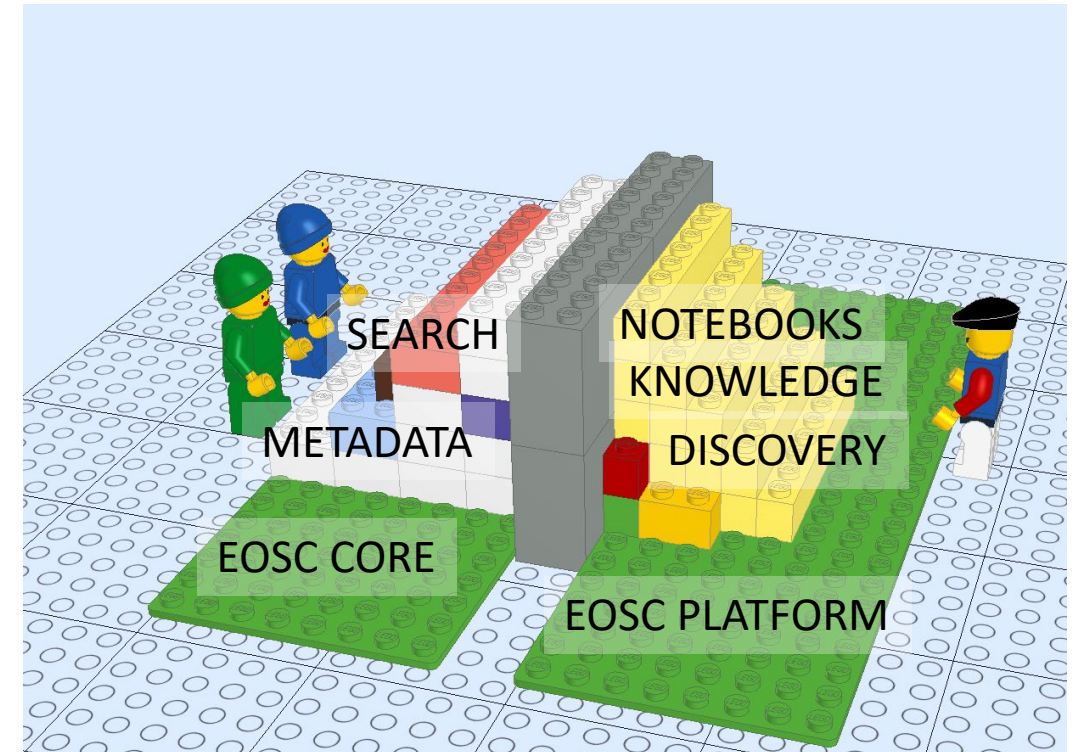

Resource for knowledge, services and digital assets

- quick discovery of data, services and assets
- sharing of engineering practices, technologies and knowledge

Machine actionable interface to the ENVRI ecosystem

- cataloguing all RIs in the ENV domain
- accessing RIs datasets via metadata search
- interface to EOSC and other users (e.g. Copernicus)
- RI repositories host their own data

Scientific demonstrators and use cases

- Made accessible as executables and VREs in Jupyter notebooks

ENVRI-hub

ENVRI Knowledge base

ENVRI Service catalogue

Single RI Access interface

ENVRI Science demonstrators

ENVRI Training platform

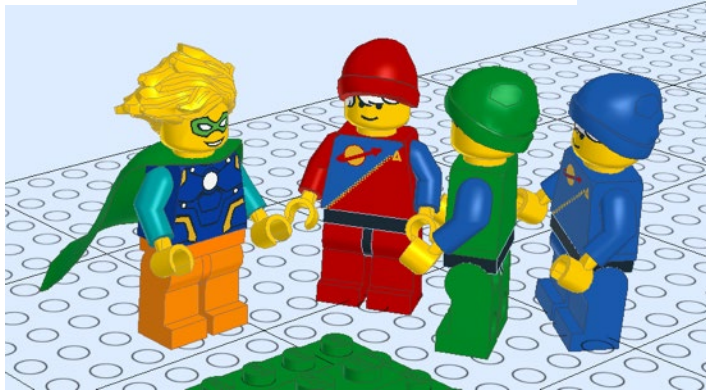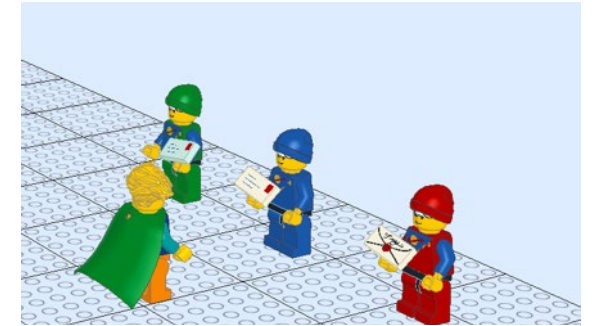ENVRI Virtual research environment

ENVRI FAIR
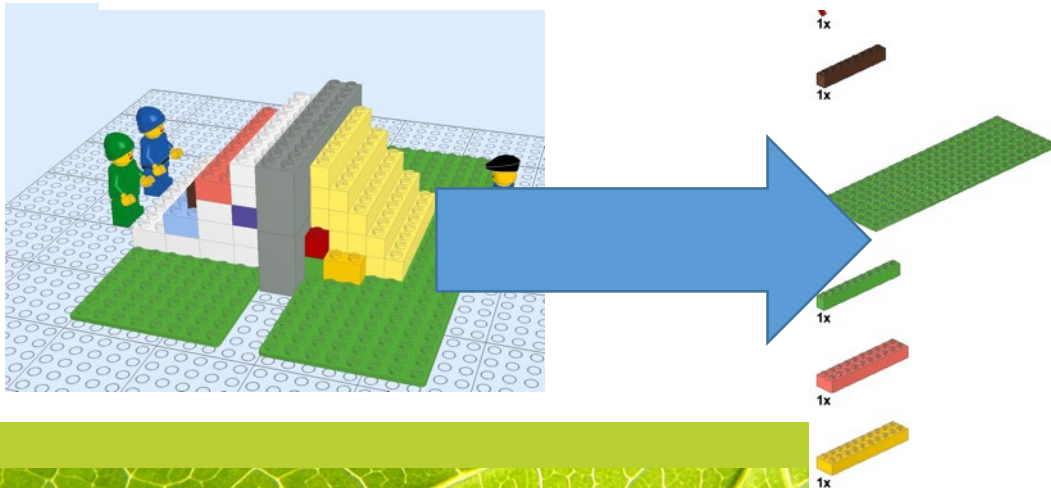
For ESFRI infrastructures

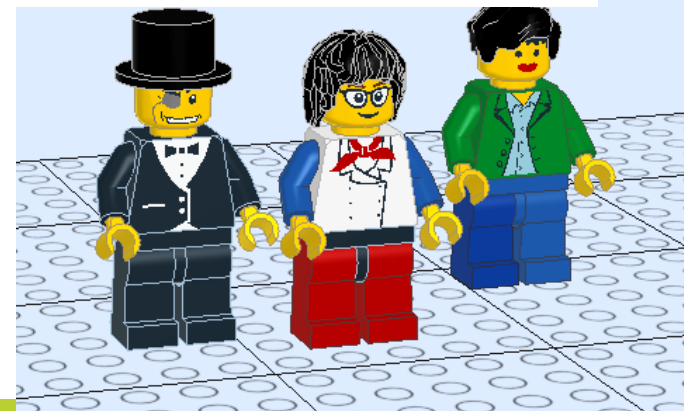DOMAIN HARMONIZATION
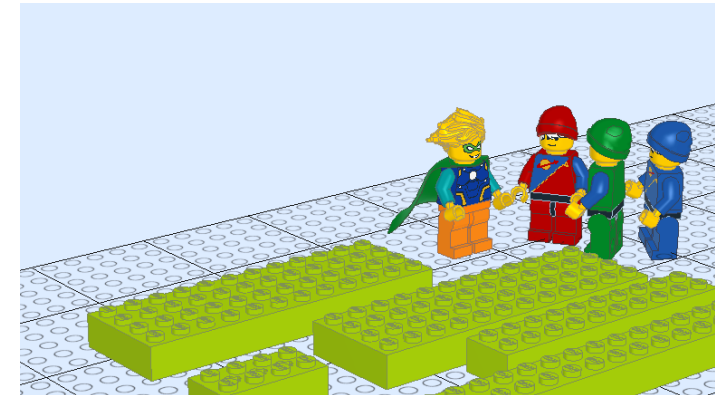
JOINTLY DEVELOPED INTEROPERABLE TOOLS

TRAINING DOCUMENTATION

EXISTING "PARTS LIST" FOR SOLUTIONS

NEW USER GROUPS FROM MULTIDICIPLINARY SERVICES

ENVRI FAIR

Interdisciplinarity: Dashboard on the State of the Environment

Upcoming demonstrator in the EOSC FUTURE

- Easily understandable real-time environmental indicators which inform public and policy makers on the state of the environment.

- An input of environmental indicators to **SSHOC** Science Project (*Climate neutral and smart cities*)
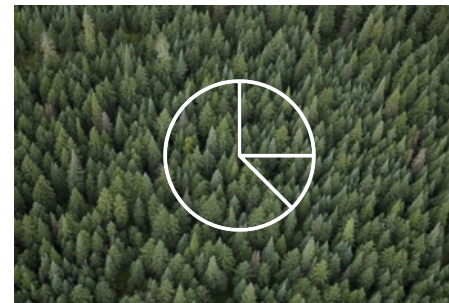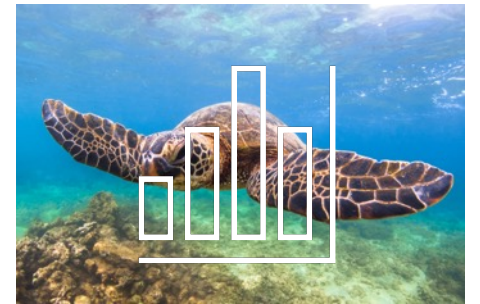
From science to operational services and decision support

- Science is based on curiosity and ingenuity, but societal support need operational and sustained services

- ENVRI Cluster platforms can help to create the interdisciplinary services, which can combine the RI services for operationalization

- Uptake to e.g. COPERNICUS programme is an important way for long term decision making support
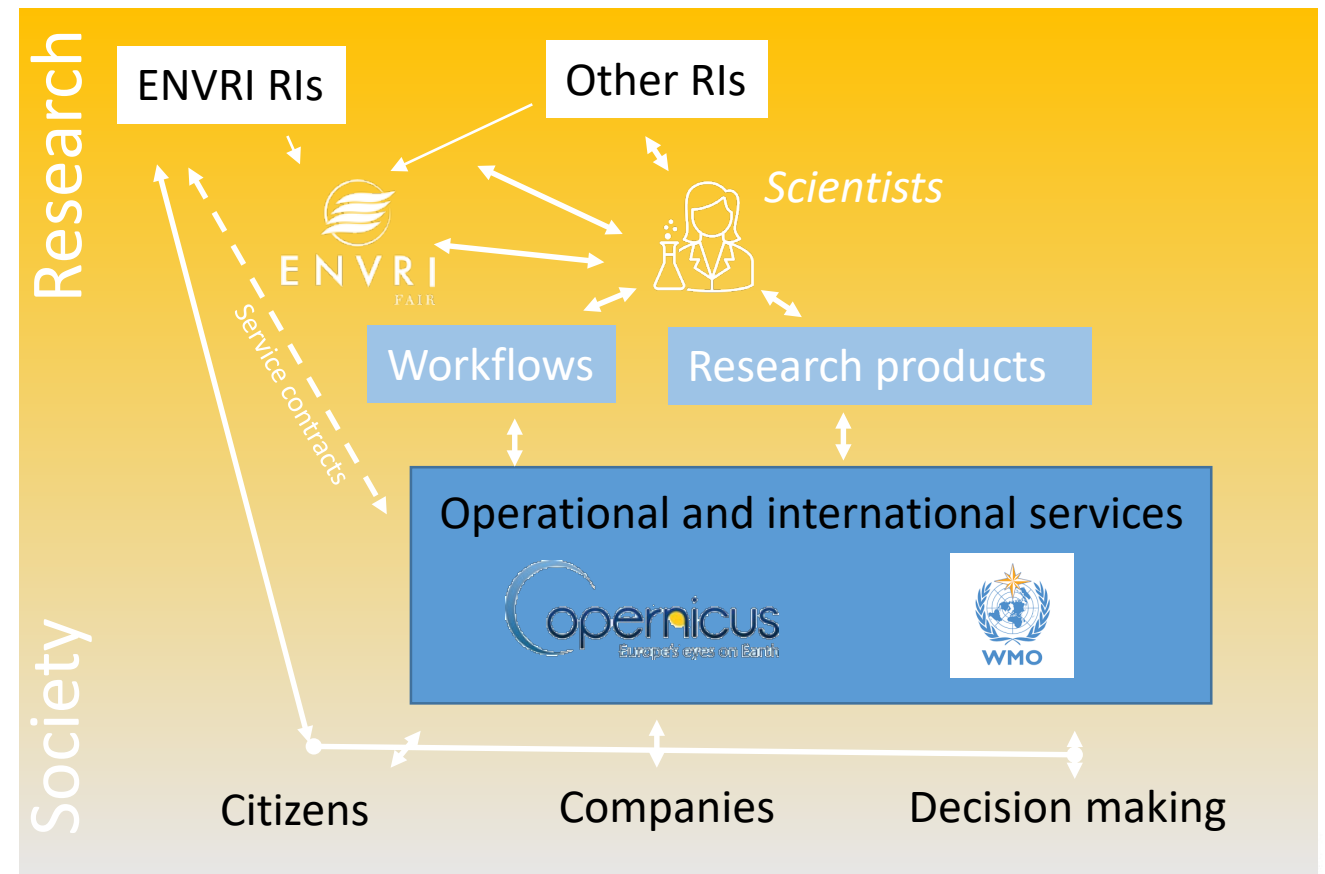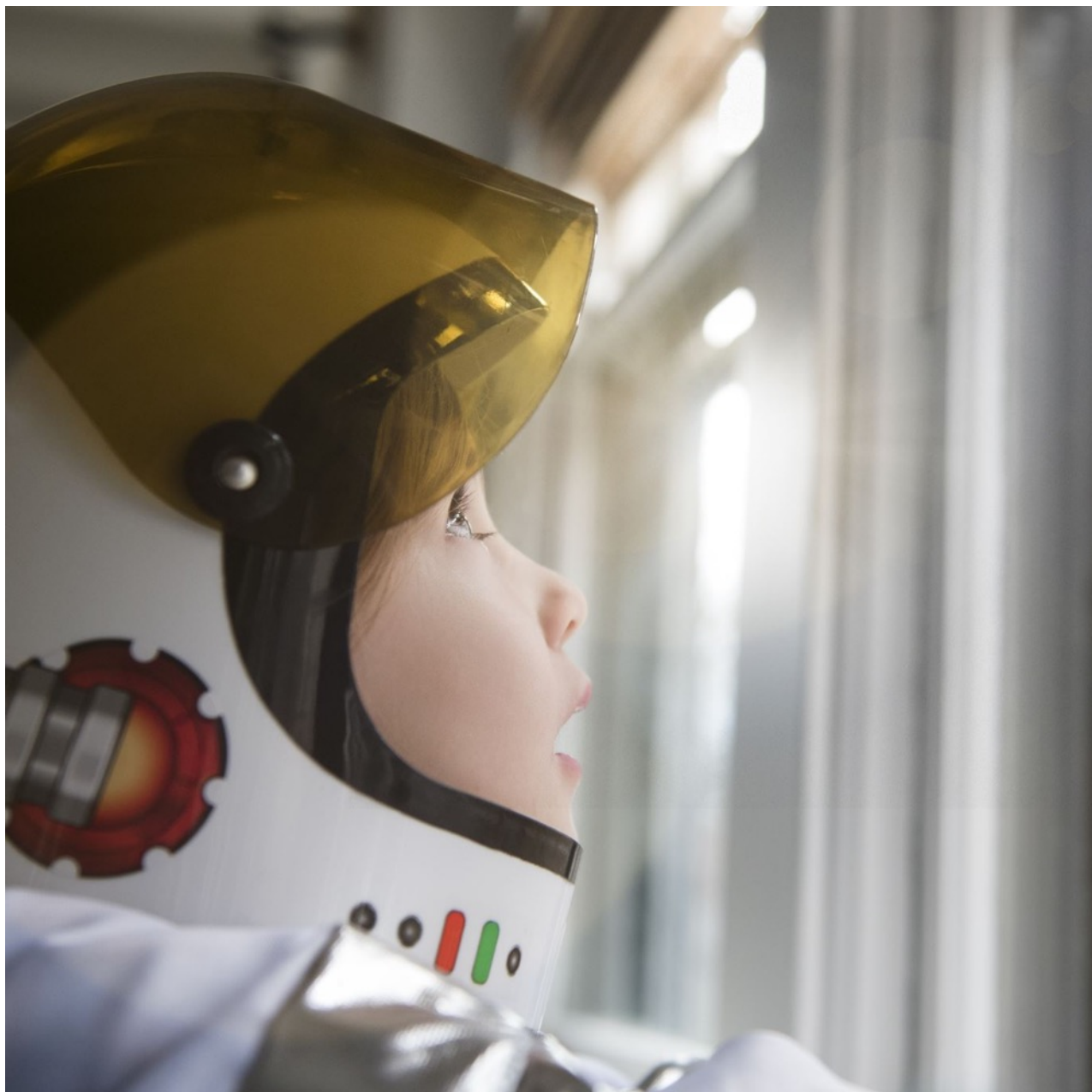
Looking into future

END OF THE CLUSTER

- Existing RI-adopted services will keep running and contribute to EOSC
- The developed "pieces" exist and can be used further
- HUB platform sustainability still undecided
- Potential divergence in new RI services particularly on new RIs
- Decreased potential for interdiciplinary societal, economic benefits
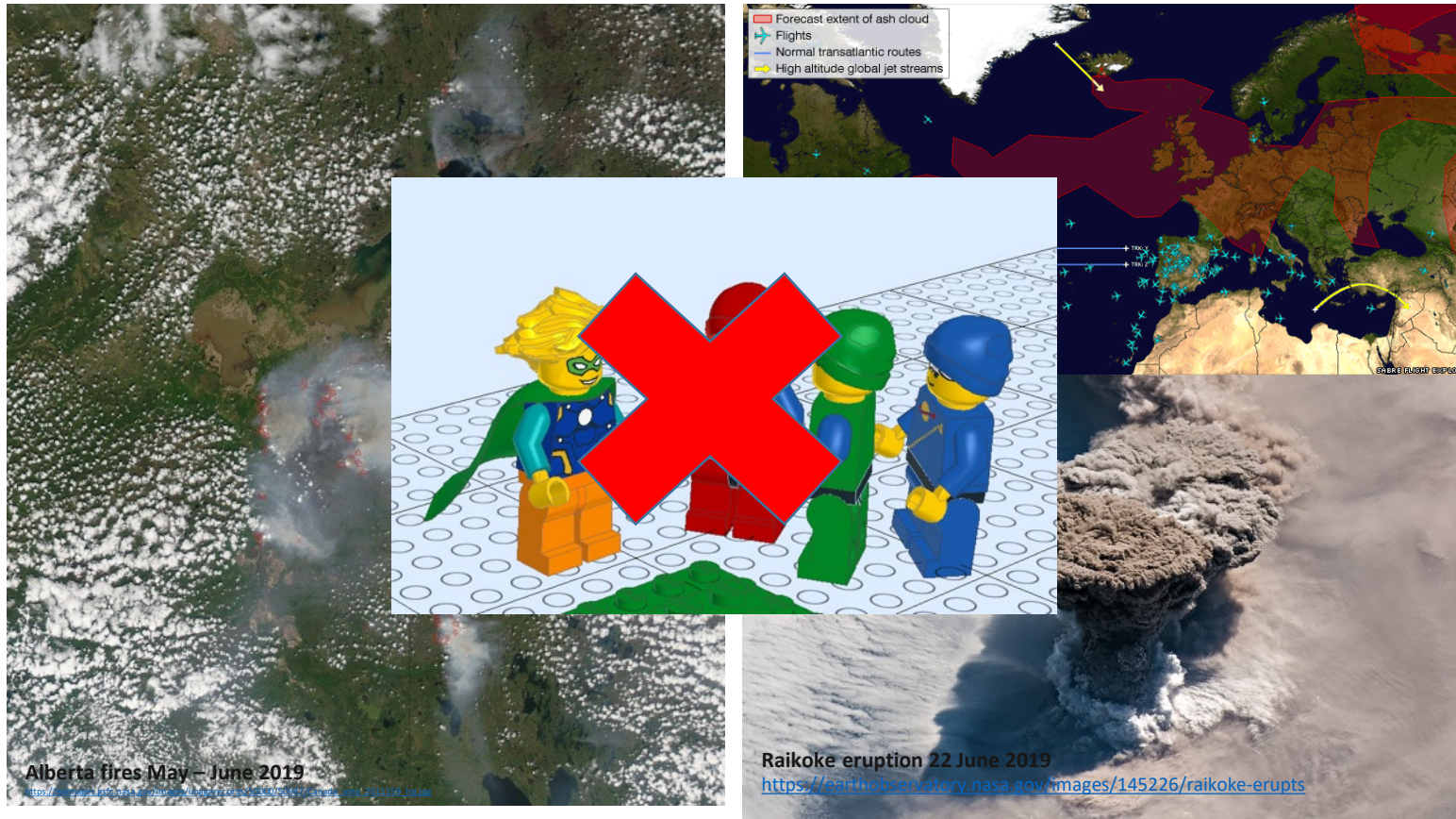- *Decreased societal resilience*

REINFORCEMENT OF THE CLUSTER

- HUB platform can be extended to national level RIs, researchers
- HUB can support Horizon Europe projects
- New ESFRI RIs and new RI services can be made multidisciplinary more efficiently
- Convergence of RI services for societal benefit
- Increased potential for societal, economic interfaces
- *Increased societal resilience*

Societal resilience – Volcanic ash & forest fire smoke

Alberta fires May – June 2019
https://www.nasa.gov/image-feature/alberta-fires-500000-people-evacuated-as-wildfires

Raikoke eruption 22 June 2019
https://earthobservatory.nasa.gov/images/145226/raikoke-erupts

- In 2010 Europe was not prepared for quick response to the Volcanic Ash Crisis
  - Capability to respond exists now in ENVRI RIs
  - Common platforms, collaboration networks, methods, plans
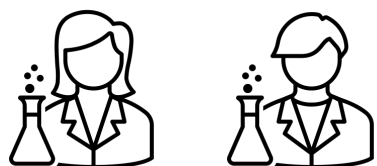- New challenges can come any time – requiring an interdisciplinary framework

Overview of ENVRI in the landscape

ESFRI RIs

Joint development and **harmonization**

Supporting **interdisciplinarity**

Create potential for **new user communities**

Direct **technical support**

Training and education

Science communities

Platforms for **discovery** and **workflows**

Harmonization of **interfaces** and **access**

Advanced RI services across ERA

OPEN SCIENCE

User communities

Best practices and standards

Science services from EOSC services

Demonstrators and documentation

Resilience and adaptation services

Commercial and societal use of RI services

Operationalization of key services

Societal engagement

SOCIETY

Questions & Anwsers

Ari Asmi
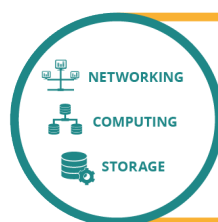*ENVRI Fair Project Co-coordinator*

Andreas Petzold
ENVRI Fair Project Co-coordinator

Populating EOSC for the Life Sciences

Niklas Blomberg, Project Coordinator
Michael Räß, WP8 lead

EOSC landscape consolidating – and EOSC-Life is integral to this consolidation

European Open Science Cloud

↓

NETWORKING
COMPUTING
STORAGE

Enable researchers to access data, storage and compute ("cloud") via a Europe-wide federation of IT services ("e-infrastructure")

E-Infrastructure consolidation

+

Findable Accessible Interoperable Reusable

Plan S

Drive the transition to Open Science (Open Data, Open Standards, Open Literature), to bring research benefits to European societies at large

Open Science

+

ENVRI FAIR
panosc
SSHOC
EOSC-Life
ESCAPE

Populate EOSC with the scientific data resources and computational tools from research infrastructures - drive usage by Europe's 1.7 million researchers
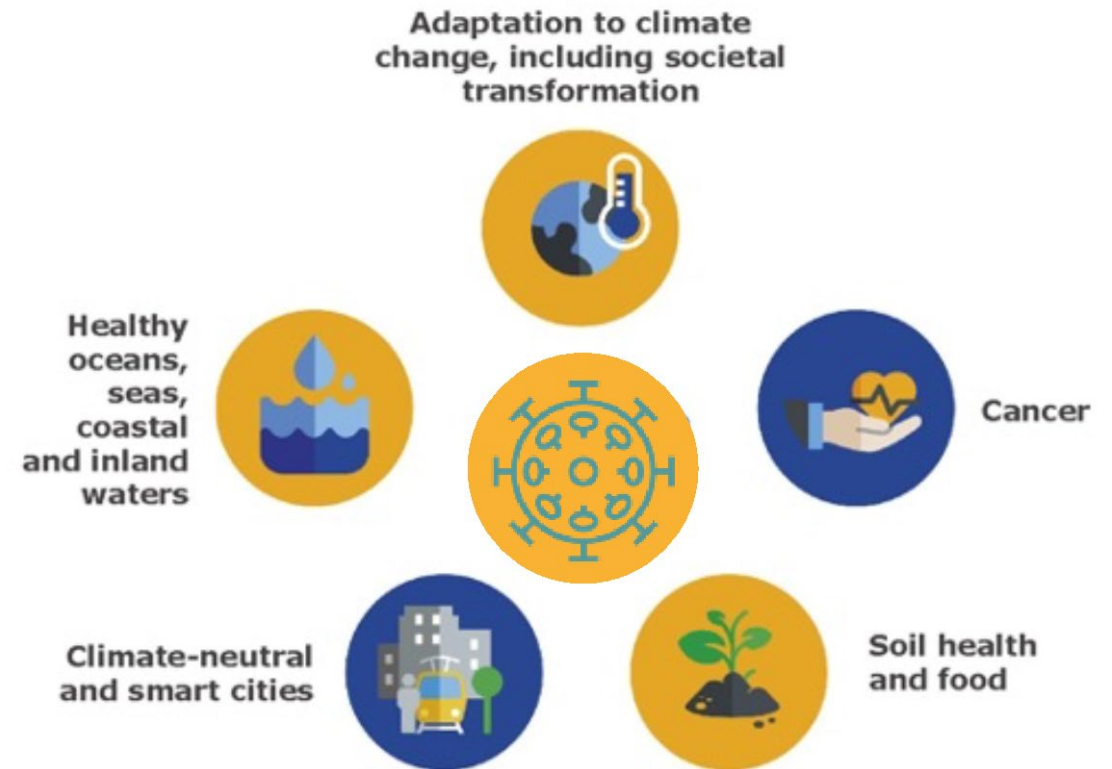
Scientific **C**ommunities' content and users

Life science data is rich and diverse

Connecting digital life science data will allow us to address major challenges facing humanity

EOSC-Life provides solutions so that life scientists can make use of data, tools and workflows in the cloud

Adaptation to climate change, including societal transformation

Healthy oceans, seas, coastal and inland waters

Cancer

Climate-neutral and smart cities
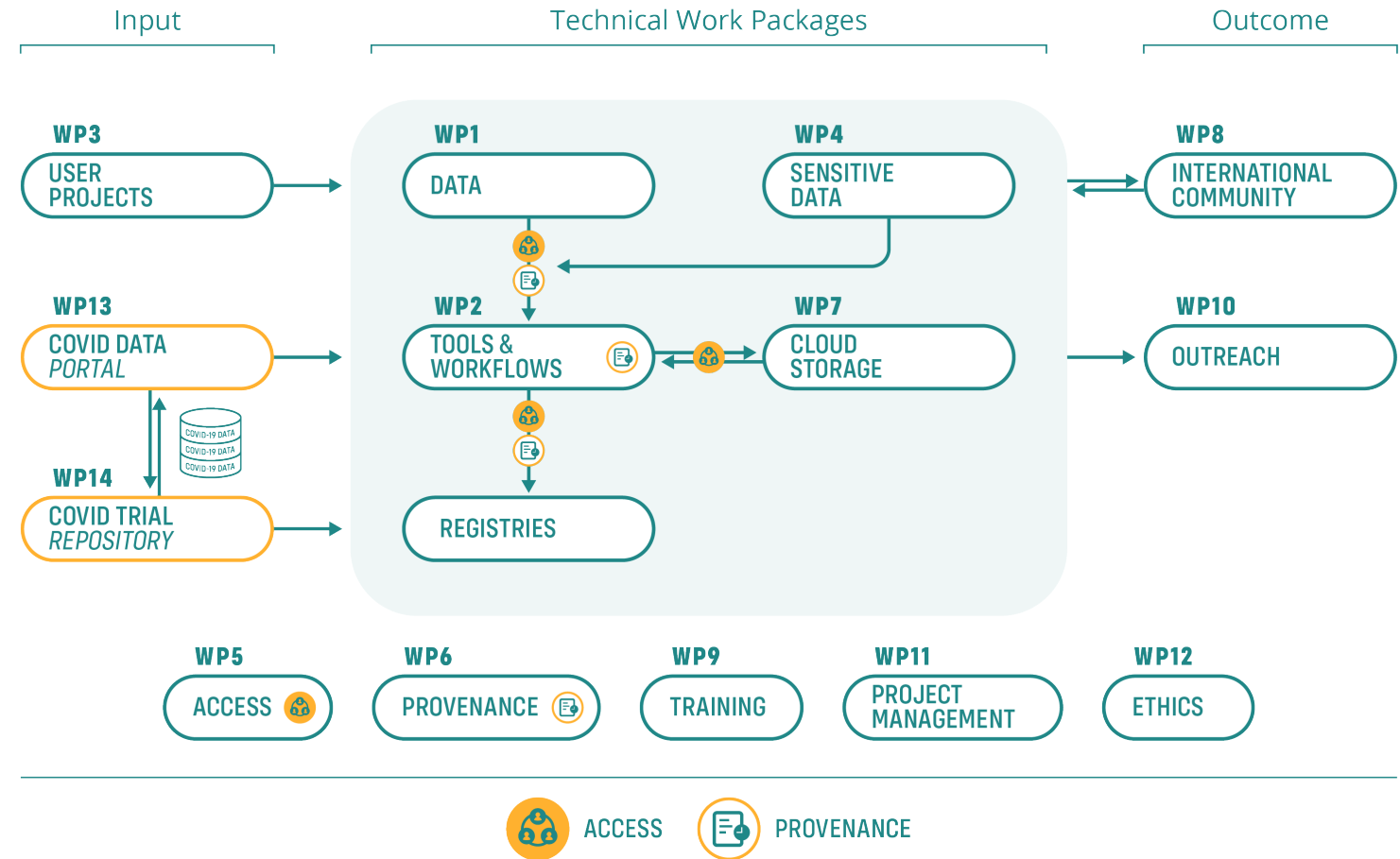
Soil health and food

EOSC-Life

- **Establish** EOSC-Life by publishing FAIR life science data resources in EOSC

- **Provide** the policies, guidelines and processes for secure and ethical data reuse

- **Populate** an ecosystem of innovative life science tools in EOSC

- **Enable** data-driven research in Europe by connecting life scientists to EOSC via open calls for participation
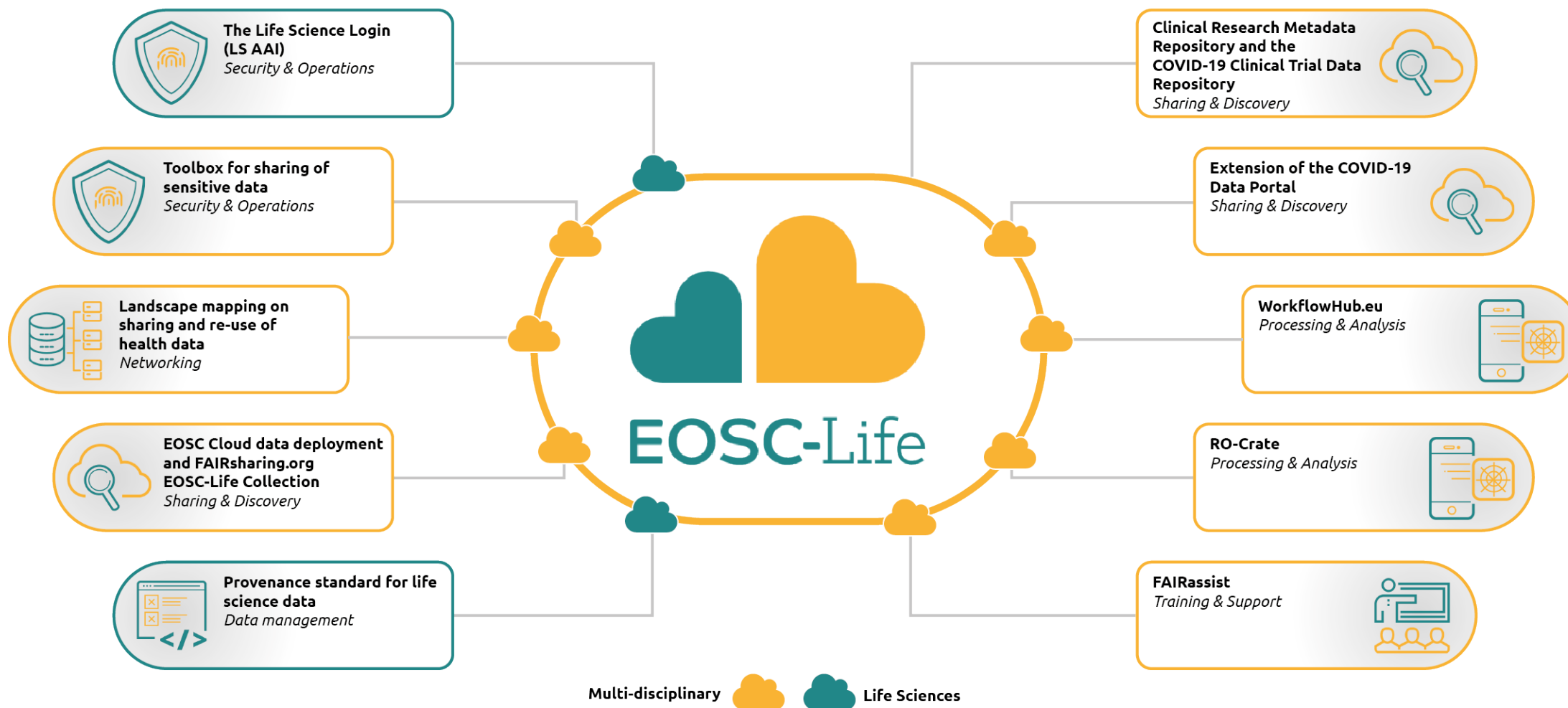
EOSC-Life prepares European life science for a new way of working

- *People: skills, new capabilities and networks*
- *Experience and processes for consolidated RI service delivery*
- *Life science data resources, workflows, registries and other services*
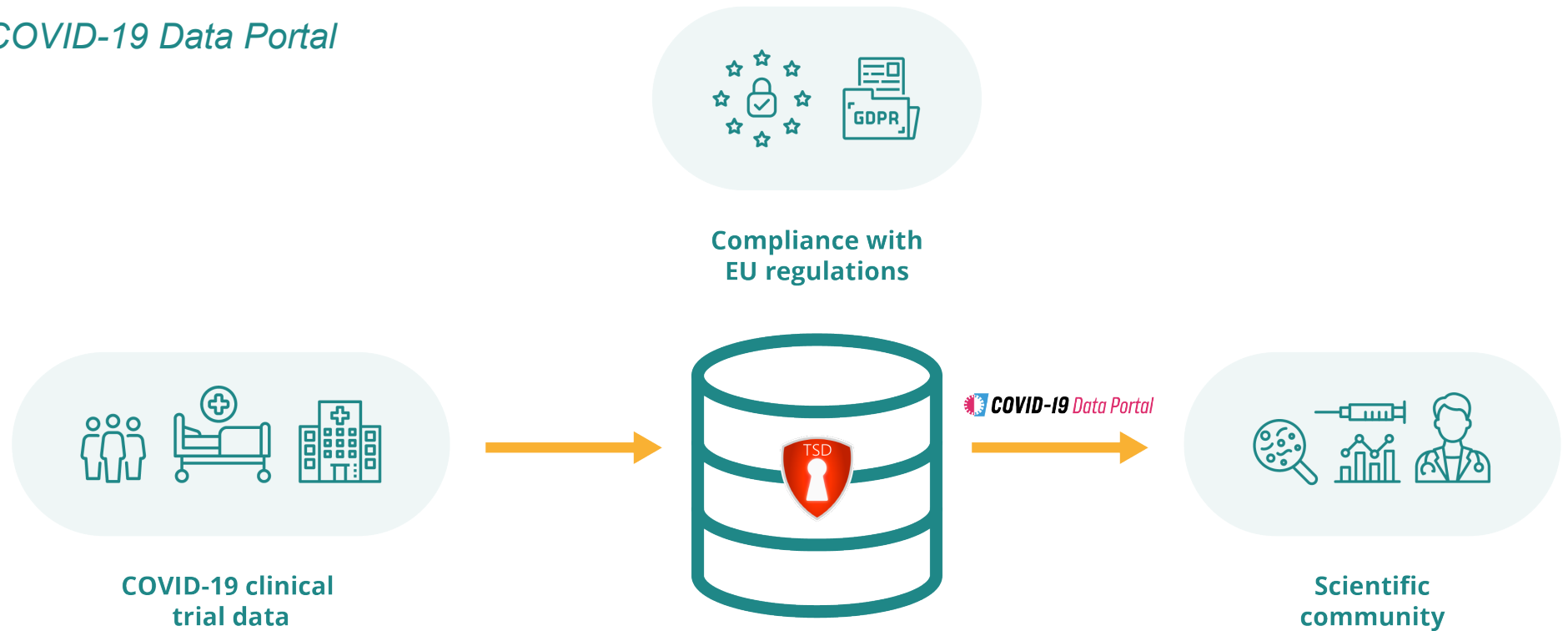- *Training materials, policies, guidelines (FAIR, Sensitive data)*
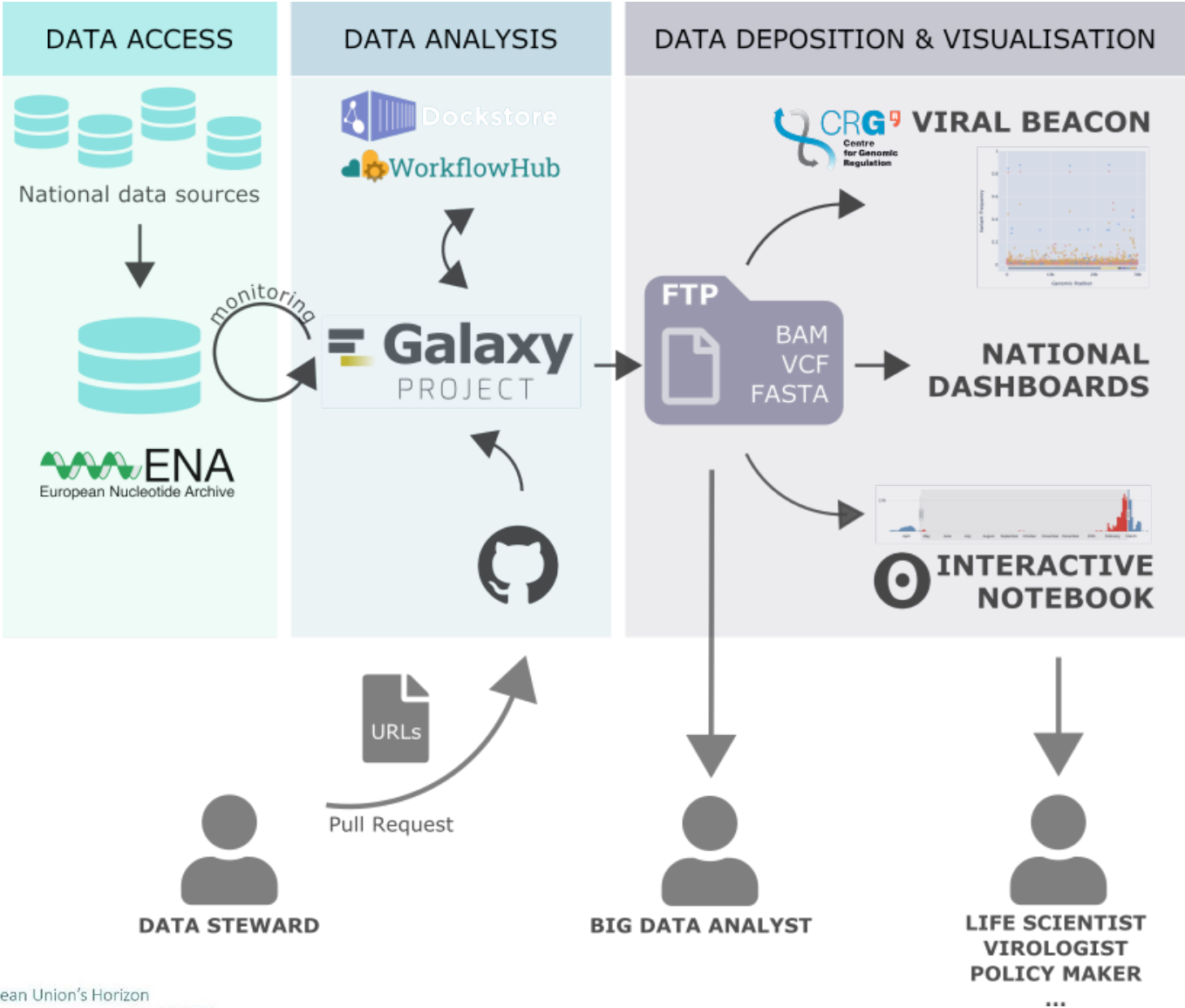
Exploitable results – EOSC Life

The Life Science Login (LS AAI)
Security & Operations

Toolbox for sharing of sensitive data
Security & Operations

Landscape mapping on sharing and re-use of health data
Networking

EOSC Cloud data deployment and FAIRsharing.org EOSC-Life Collection
Sharing & Discovery

Provenance standard for life science data
Data management

Clinical Research Metadata Repository and the COVID-19 Clinical Trial Data Repository
Sharing & Discovery

Extension of the COVID-19 Data Portal
Sharing & Discovery

WorkflowHub.eu
Processing & Analysis

RO-Crate
Processing & Analysis

FAIRassist
Training & Support

Multi-disciplinary   **Life Sciences**

EOSC-Life's response to the COVID-19 pandemic

- *Supported International COVID-19 biohackathon with cloud resources*
- *Released WorkflowHub.eu 1 year early*
- *Building a repository to host COVID-19 clinical trial data*
- *Extension of the COVID-19 Data Portal*

Compliance with EU regulations

COVID-19 clinical trial data

COVID-I9 *Data Portal*

Scientific community

Galaxy for COVID: covid19.galaxyproject.org

# Need from Users, Developers and Infrastructure administrators Drive the ELIXIR & EOSC-Life Tools ecosystems
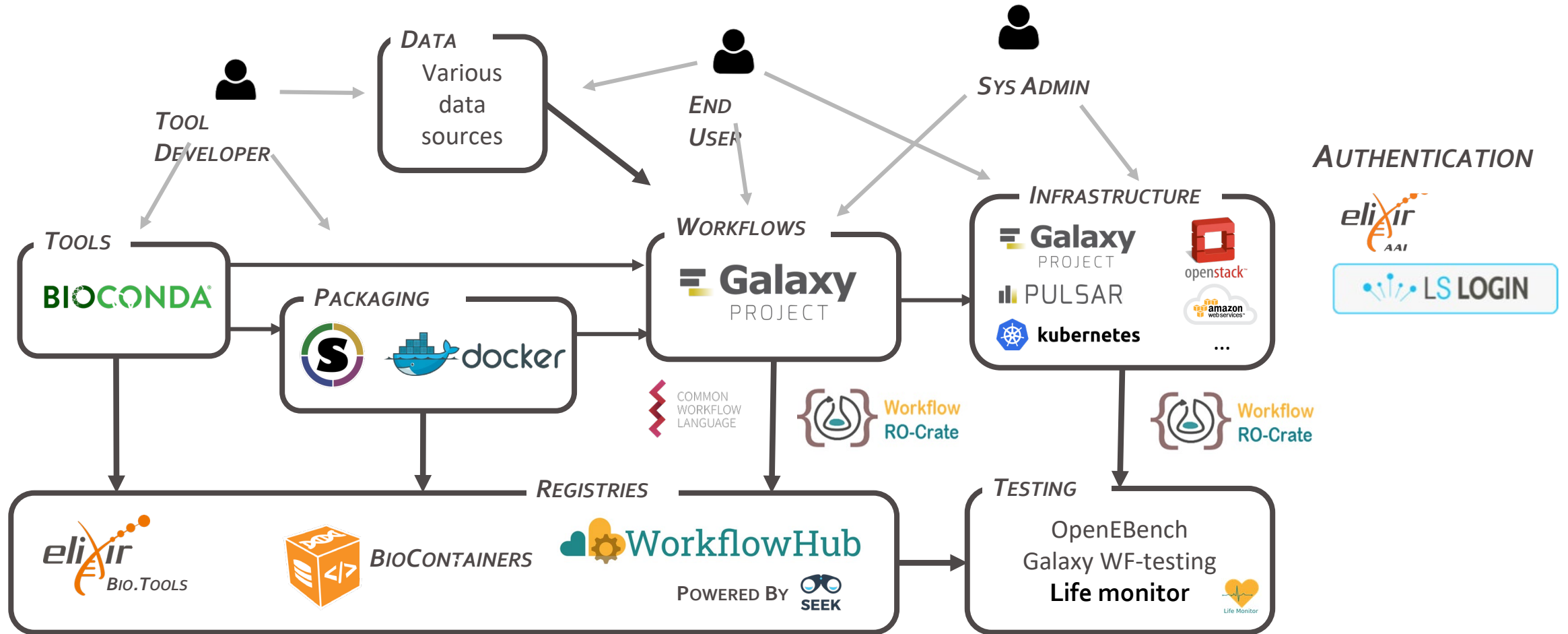
Distributed analysis
Pulsar network

The most innovative computing centers across Europe are currently interested to share their remote computation power to support the UseGalaxy.eu load:

- DE, de.NBI cloud
- IT, ReCaS-Bari
- BE, Vlaams Supercomputer Centrum (VSC)
- PT, Tecnico ULisboa
- ES, Barcelona Supercomp. Center (INB-BSC)
- NO, University of Bergen
- CZ, CESNET
- FI, CSC
- UK, Diamond Light Source
- FR, GenOuest
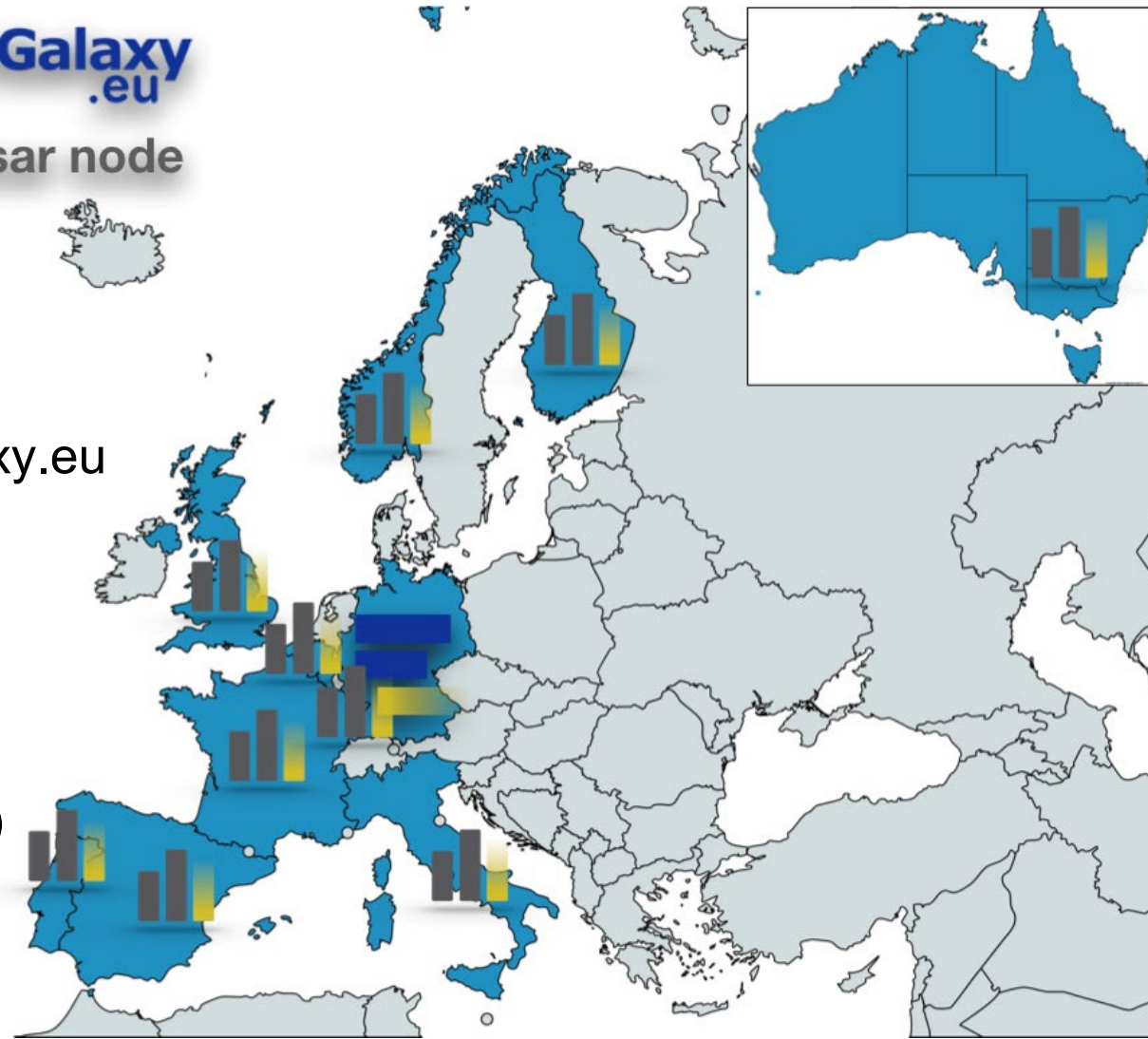
https://pulsar-network.readthedocs.io/en/latest/project/partners.html

EOSC-Life "Toolbox for sensitive data sharing"

Documented requirements for hosting/distributing and access control for sensitive data

Landscape analysis of national legal and ethical requirements for sensitive data sharing

Compile current assets into the EOSC-Life Toolbox for sensitive data sharing

- Assembled from existing resources to create a toolbox for cloud management of sensitive data in general, and the European Open Science Cloud in particular.
- Agreed Categorisation system with an initial 110 tagged resources
- All reports and materials are Open Access and on Zenodo: 10.5281/zenodo.4483693, 10.5281/zenodo.4311093, 10.5281/zenodo.4311113, 10.5281/zenodo.4591010

EOSC-Life

- ✓ Established EOSC-Life by publishing FAIR life science data resources in EOSC

- ✓ Providing the policies, guidelines and processes for secure and ethical data reuse

- ✓ Populating an ecosystem of innovative life science tools in EOSC

- ✓ Enabling data-driven research in Europe by connecting life scientists to EOSC via open calls for participation

EOSC-Life - Points for discussion

www.eosc-life.eu

➤ **Transition** the focus in EOSC from principles and organisation to operations. Incorporate production services 'as part of EOSC'

➤ **"Practicality"** - focus on practical implementations, evidence of usability and concrete use cases rather than the sunlit uplands of theoretical perfection

➤ **Consider the roles of EOSC actors** – b2b services *and* entry points for users (e.g. workflows as first-class citizens)

➤ **ESFRI have large established user-communities and production services** – EOSC-Life and our other "cluster activities" build operational processes that link research outputs from RI services to the missions objectives and the open data targets of EOSC

➤ **ESFRIs have established solutions for domain-specific needs** (e.g. data protection, ethics, compliance with Nagoya protocol)

EOSC-Life
www.eosc-life.eu

BIOBANKING &
BIOMOLECULAR RESOURCES
BBMRI-ERIC®

TRANSLATIONAL
RESEARCH
eatris

CLINICAL TRIALS
ECRIN
EUROPEAN CLINICAL RESEARCH
INFRASTRUCTURE NETWORK

CURATED
DATABASES
elixir

MARINE MODEL
ORGANISMS
EMBRC
EUROPEAN
MARINE
BIOLOGICAL
RESOURCE
CENTRE

PLANT
PHENOTYPING
EMPHASIS

HIGHLY PATHOGENIC
MICROORGANISMS
erinha
European Research Infrastructure
on Highly Pathogenic Agents

SCREENING AND
MEDICINAL CHEMISTRY
eu openscreen

ADVANCED IMAGING
TECHNOLOGIES
EURO BIOIMAGING

FUNCTIONAL
GENOMICS
INFRAFRONTIER
mouse disease models

STRUCTURAL
BIOLOGY
instruct
ERIC

SYSTEMS
BIOLOGY
ISBE
Infrastructure
for Systems Biology
Europe

MICROORGANISMS
MIRRI
MICROBIAL RESOURCE
RESEARCH INFRASTRUCTURE

ESCAPE and its wide synergies for a long-term perspective

June 11 2021

Elena Cuoco, *EGO & Scuola Normale*
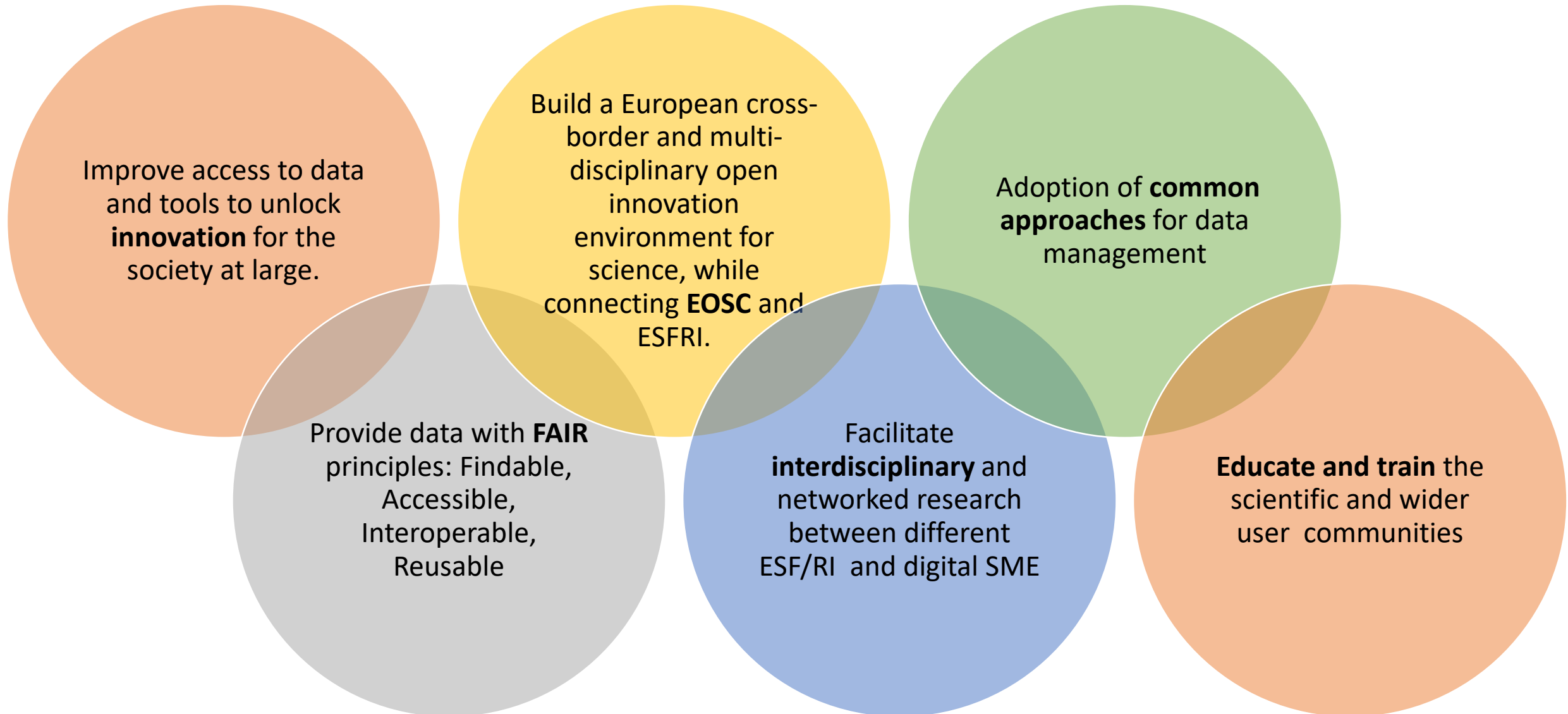*Inputs from Giovanni Lamanna and Ian Bird*

https://projectescape.eu/

ESFRI Science Clusters' Long Term Commitments to Open Science - 11 June 2021

ESCAPE: **E**uropean **S**cience **C**luster of **A**stronomy & **P**article physics **E**SFRI research infrastructures

We bring together the astronomy, astro-particle, particle and nuclear physics communities

ESCAPE cluster main goals

Improve access to data and tools to unlock **innovation** for the society at large.

Build a European cross-border and multi-disciplinary open innovation environment for science, while connecting **EOSC** and ESFRI.

Adoption of **common approaches** for data management

Provide data with **FAIR** principles: Findable, Accessible, Interoperable, Reusable

Facilitate **interdisciplinary** and networked research between different ESF/RI and digital SME

Educate and train the scientific and wider user communities

ESCAPE PARTNERs

Particle Physics

Astrophysics

The ESCAPE cluster comprises world-class research facilities in astronomy and particle physics. **ELT, CTA, SKA, KM3NeT, EST, HL-LHC, FAIR, JIV-ERIC, LSST, EGO-Virgo.** (Credit: ESCAPE)

ESFRI Science Clusters' Long Term Commitments to Open Science - 11 June 2021

ESCAPE consortium

- **31** partners (including 2 SMEs)

- **7** ESFRI projects & landmarks: **CTA, ELT, EST, FAIR, HL-LHC, KM3NeT, SKA**

- **2** pan-European International Organizations: **CERN, ESO** (with their world-class established infrastructures, experiments and observatories).

- **2** European research infrastructures: **EGO** and **JIV-ERIC**

  Formal commitment of their legal entities and management boards required by EC

- **1** involved initiative/infrastructure: EURO-VO

- **4** supporting European consortia: APPEC, ASTRONET, ECFA and NuPECC.

- Budget: **15.98 M€**

- Started: **1/2/2019**

- Duration: **48** months (end date 31/1/2023)

- Coordinator: **CNRS-LAPP**
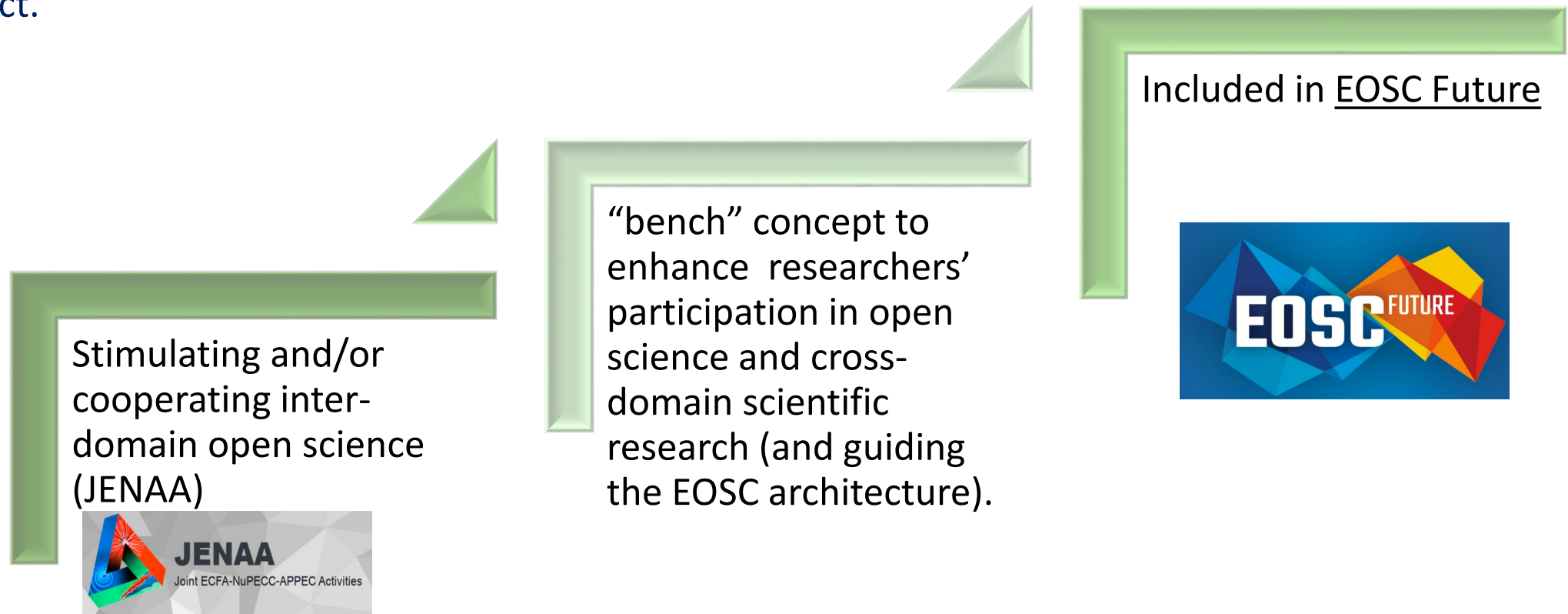
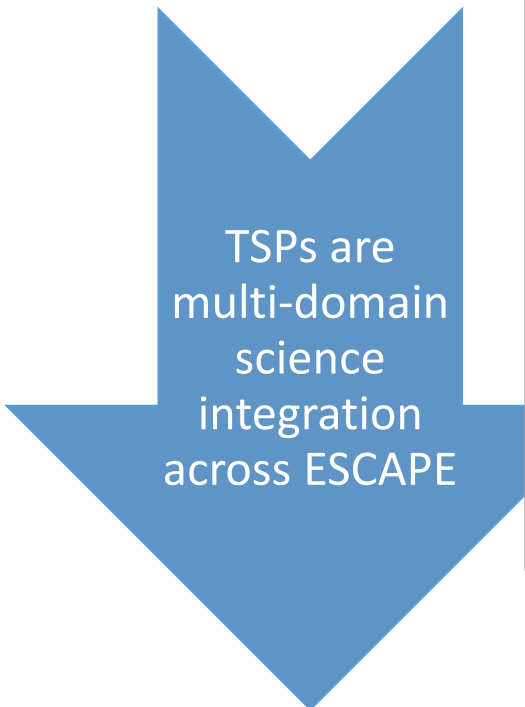ESFRI Science Clusters' Long Term Commitments to Open Science - 11 June 2021
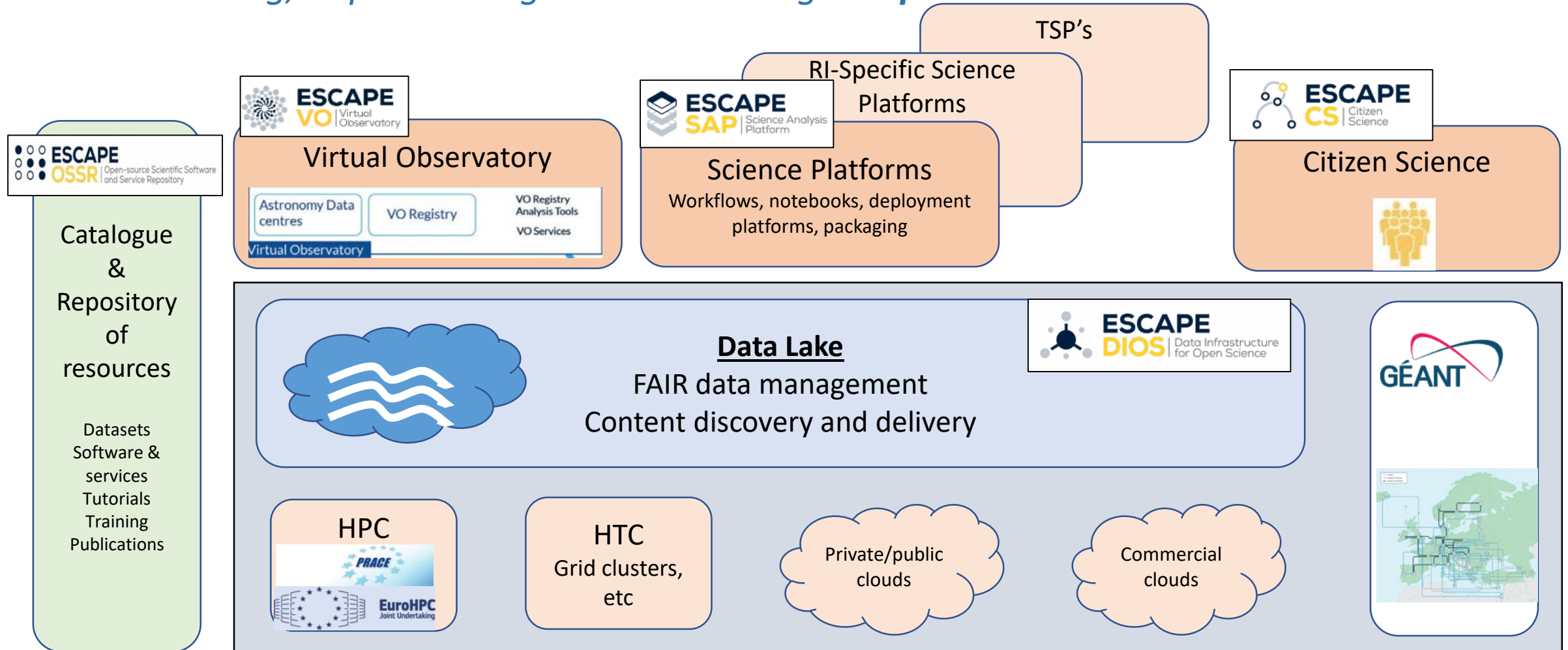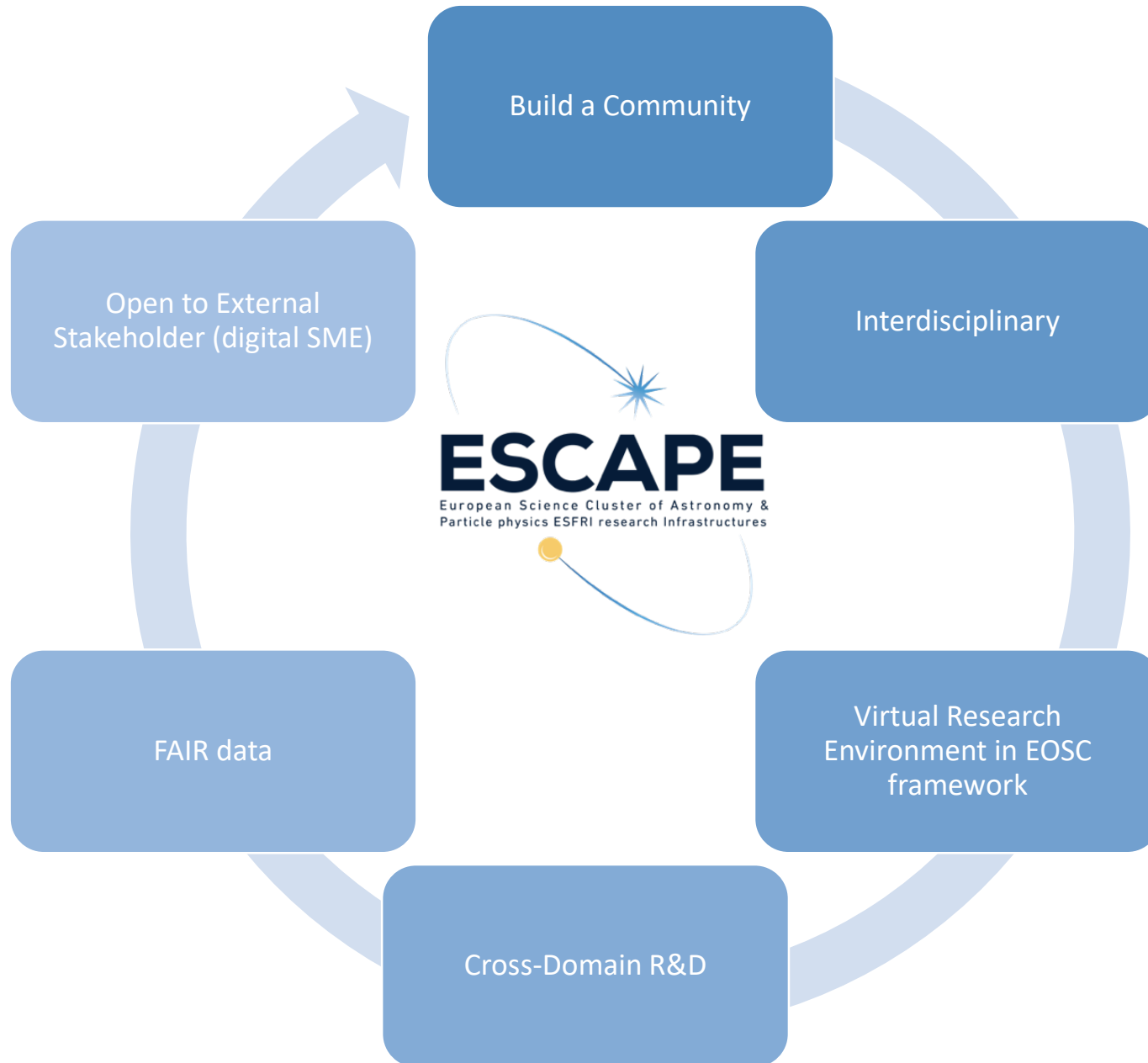
Enhance researchers' participation in EOSC
…through (Test) Science Projects - TSPs

Originally part of the ESCAPE work programme, proposed to validate ESCAPE services for Open Science at the end of the project, ESCAPE-TSP concept finds consensus and evolves for a larger impact.

Included in EOSC Future

"bench" concept to enhance researchers' participation in open science and cross-domain scientific research (and guiding the EOSC architecture).

Stimulating and/or cooperating inter-domain open science (JENAA)

Enhance researchers' participation in EOSC

TSPs are multi-domain science integration across ESCAPE

- demonstrate new cutting edge open science capabilities, making use of the services implemented within ESCAPE
- feedback on the capabilities delivered by ESCAPE
- benefit real science goals in exploring synergies between the ESFRIs and largely among three scientific communities Astrophysics/Astroparticle, accelerator-based Particle and Nuclear Physics (supported by consortia of EU member states, Universities/Institutes)

1. Dark Matter Science Project
2. Extreme Universe & Gravitational waves Science Project

JENAA
Joint ECFA-NuPECC-APPEC Activities

A top-down endorsement for a bottom-up approach based on Expression of Interests (EoI) subscribed by researchers

Reaching new communities
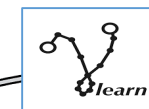
ESCAPE Innovation Capacity and Procurement

ESCAPE results and actions for Open Science are reaching out (ex. Discussions in progress with ASTRI, DUNE, GANIL-SPIRAL2, FCC et al.) and becoming global (e.g. USA, Japan, etc.)

Co-developments with digital SMEs, e.g.

- **Wavefier**: real-time Machine Learning Classifier for transient signals in Gravitational Waves
- **Gamma-Learn**: real-time Machine Learning pipeline for Gamma-ray astronomy
- Combining ESCAPE with European Regional Development Fund programme (*ex. cooperation, training and innovation schemes for Society and Economy* - **IDEFICS @ LAPP**)
- Leveraging **industrial ICT** cooperation schemes (within ESCAPE ESFRI RIs)

Future perspectives and role of Cluster

Outlook into the future (e.g. Horizon Europe) :

ESCAPE community proposals for EOSC connections with the Common European Data Spaces.
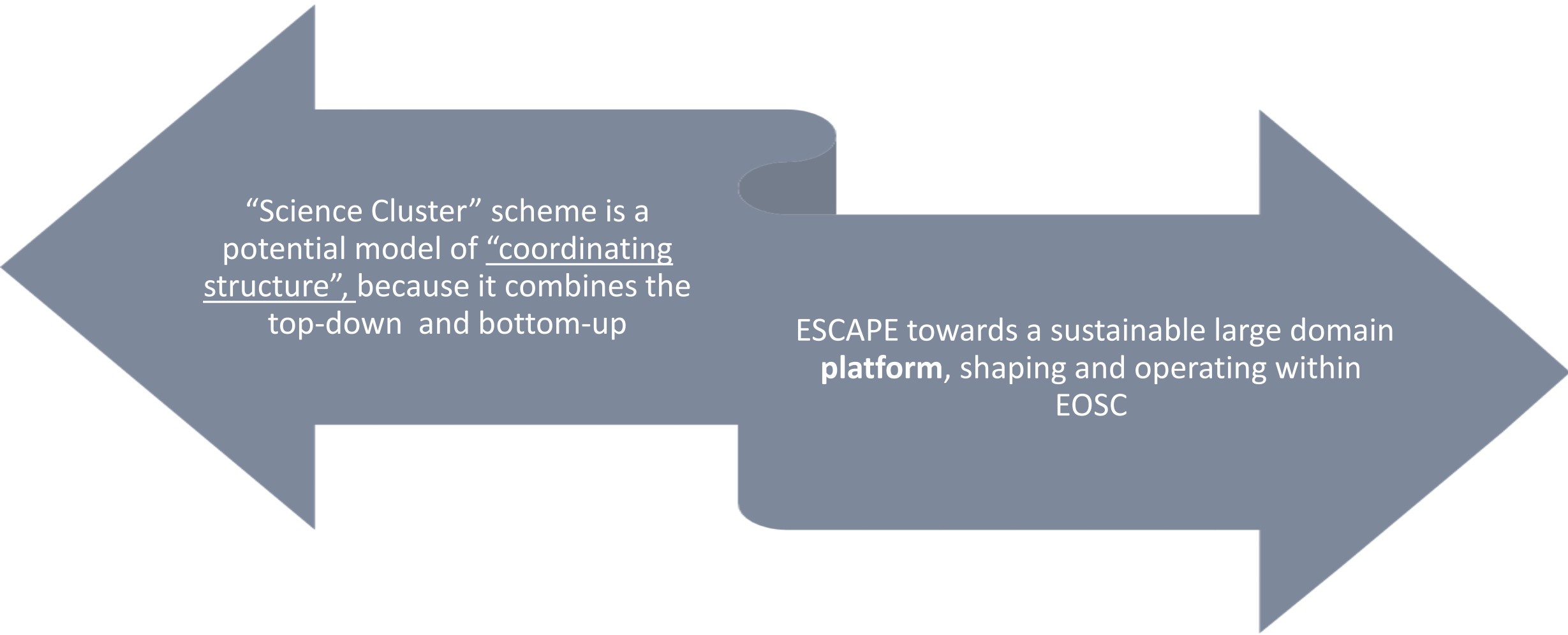
- *Industrial (manufacturing), health and skills data space*
- *Green deal and Energy data space*

Certified open archive to be exploited by any **new Big Science** research facility to share innovation, practices and methods.

Any digital object from R&D and innovation works within the ESCAPE community should be *FAIR* and accessed from a **single entry point**

[...]

Future perspectives and role of Cluster

"Science Cluster" scheme is a potential model of "coordinating structure", because it combines the top-down and bottom-up

ESCAPE towards a sustainable large domain **platform**, shaping and operating within EOSC

ESCAPE Future

- Sustained thematic consortium for the sustainability of EOSC
- Additional thematic RI's are interested in participating

ESCAPE intends to remain as a collaboration after the end of the current project

- Data Management at Exascale
- Common software challenges
- Cross-fertilisation of software tools and services
- Building a platform for multi-messenger astronomy and cross-domain collaborations
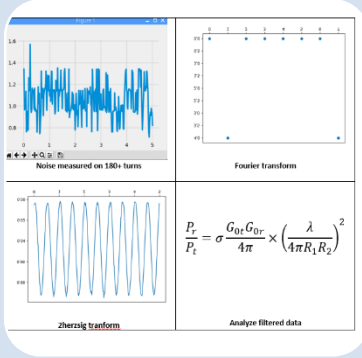- Connection of data infrastructure to heterogenous computing
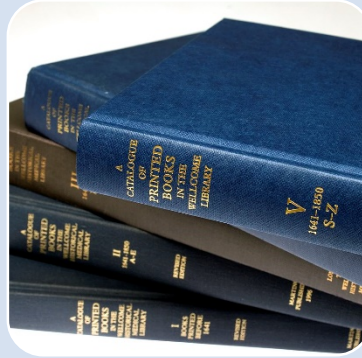
Many potential collaborative actions
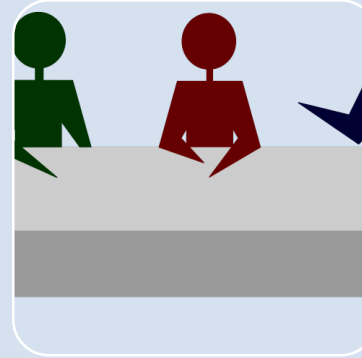
ESCAPE   long term activity

Services for integration of the Exabyte scale data infrastructure supporting Open Science and FAIR data;

Interoperable data-analysis platform

Development and sustainability of the services for the software catalogue and workflow

Partnership with EuroHPC/Prace/FENIX to provide the services for integration of Data-Lake with HPC resources;

Collaborative scientific environment. Include new ESFRI and SME

Global integration of some of the above with global partners in USA, Australia and Africa

Summary

ESCAPE brings together Astronomy, Astrophysics, Astro-Particle, High Energy and Nuclear Physics communities

Broader synergies within a large scientific community and for innovation/society

Broader synergies with the other Science Clusters , e-infrastructures for EOSC

Thank you!

elena.cuoco@ego-gw.it

Questions & Anwsers

Ian Bird
ESCAPE Technical Coordinator

Elena Cuoco
ESCAPE General Assembly Chair

Giovanni Lamanna
ESCAPE Project Coordinator

COFFEE BREAK

11:05 - 11:20

Grab your Coffee now ;)

#ESFRI_SC2021

ESFRI Science Clusters' Long Term Commitments to Open Science - 11 June 2021

PaNOSC/ExPaNDS

ESFRI Science Clusters long-term commitment to Open Science

11 June 2021

Rudolf Dimper (ESRF-PaNOSC) – **Patrick Fuhrmann** (DESY ExPaNDS)

Photon and Neutron analytical research infrastructures in Europe

Fundamental, applied and industrial research on atomic structure and dynamics, link function and properties to atomic structure
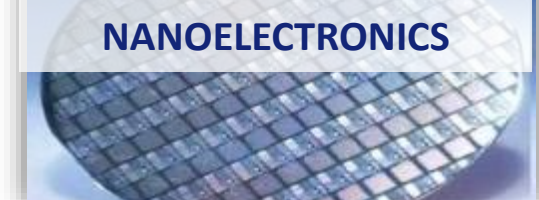

ENERGY & ENVIRONMENT

BIOLOGY & HEALTH
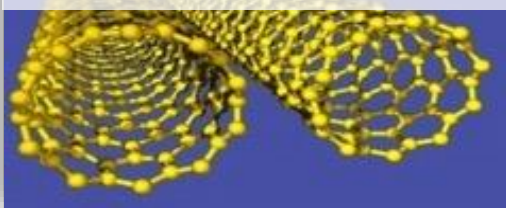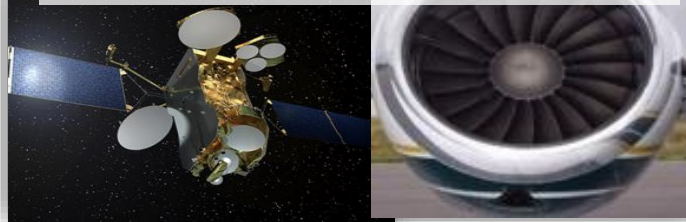
FOOD

MICRO & NANOELECTRONICS

NEW MATERIALS

CHEMISTRY & CATALYSIS

SPACE & TRANSPORT

GEOSCIENCES & EXTREME CONDITIONS
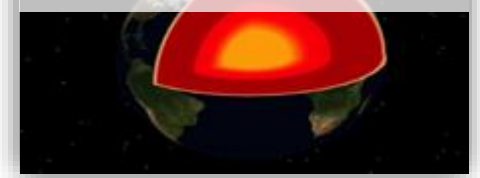
CULTURAL & NATURAL HERITAGE

panosc

ExPaNDS
European Open Science Cloud Photon
and Neutron Data Services

Together PaNOSC+ExPaNDS represent almost all Photon and Neutron sources in Europe

PaNOSC factsheet

Call: Horizon 2020 InfraEOSC-04

Partners: ESRF, ILL, XFEL.EU, ESS, CERIC-ERIC, ELI-DC, EGI

Description: Cluster of ESFRI Photon and Neutron sources

Observers/non-funded: GÉANT, EUDAT, national RIs

Linked 3rd parties via EGI: DESY, STFC, CESNET

Status: Started 1/12/2018

Github: https://github.com/panosc-eu

Home page: https://panosc.eu

Twitter: @PaNOSC_eu #PaNOSC

Budget: 12 M€

Coordinator: ESRF

Started: 1/12/2018

Duration: 4 years

ExPaNDS factsheet

Call: Horizon 2020 INFRAEOSC 5B

Partners: EGI, DESY, Max IV, Soleil, ALBA, HZB, HZDR, UKRI, Diamond, Elettra, PSI

Description: National Photon and Neutron sources

Status: Started 1/12/2018

Github: https://github.com/ExPaNDS-eu/ExPaNDS

Home page: https://expands.eu

Twitter: https://twitter.com/ExPaNDs_EU

Budget: 6 M€

Coordinator: DESY

Started: 1/09/2019

Duration: 3 1/2 years

Some of the PaN Research Infrastructures
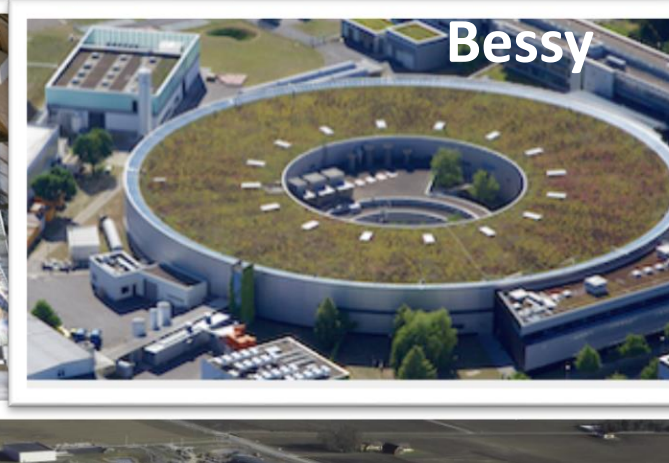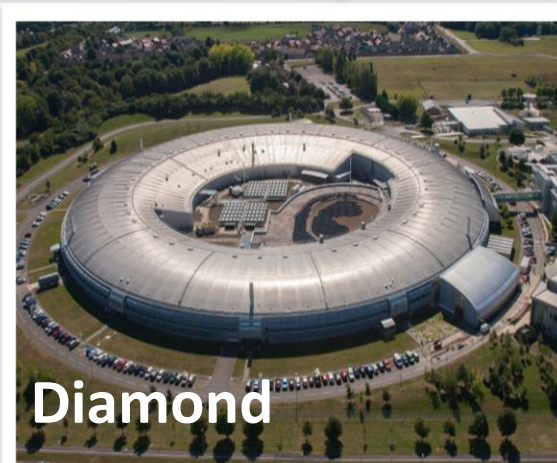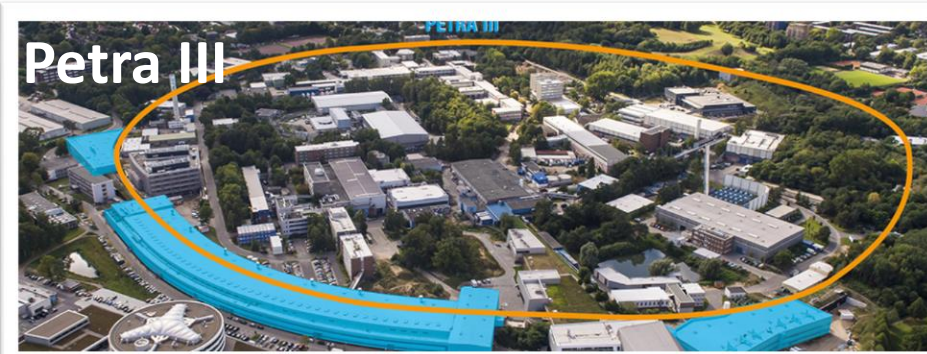
PaNOSC/ExPaNDS + EOSC: building data services on FAIR data

Final Report and Action Plan from the European Commission Expert Group on FAIR Data

TURNING FAIR INTO REALITY

2018

Findable **A**ccessible **I**nteroperable **R**eusable

= DATA + SERVICES

Where is the DATA?

- How do I find them?
- How do I get them?
- How do I look at them?
- What does they mean?
- Are they correct?

REDUCING THE
BOTTLENECK EFFECT:
"What we're trying to do here is
expedite the time to discovery.
Scientists should be able to
focus on their science
without having to become
experts in data management."
—Shawn McKee
research scientist in physics

454 | NATURE | VOL 533 | 26 MAY 2016

How can I:
- download TBs of raw data?
- search, view and process data remotely?
- access a Jupyter notebook to process my data?
- make my data open and get a DOI to cite?
- get credentials to login and use these services?

credits – Jon Taylor (ESS)

PaNOSC + EOSC should offer:

1. Remote acces to analytical facilities

2. Downloadable metadata & raw data

3. Software services to browse and analyse raw data

4. Platform as a service to do computations + simulations

5. Common space to share progress and workflows

6. Long-term data archive beyond the RI data policies
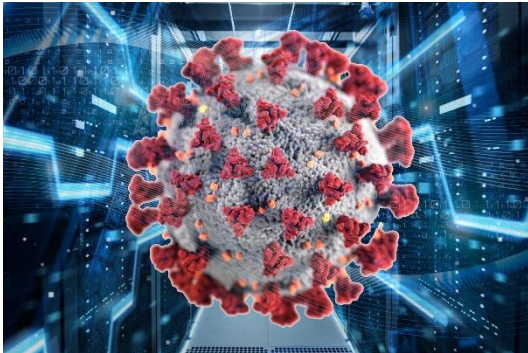
= is amplifying the needs and making them urgent

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ExPaNDS
European Open Science Cloud Photon
and Neutron Data Services

VISA = remote access during COVID-19 and beyond

- **Provide remote data analysis services with access to**
  - Experimental data
  - Analysis software
  - Compute infrastructure
  - Support (IT and Scientific)
- **Make access as simple as possible using a web browser**
- **Allow scientific collaborations**
- **Enable remote experiments**
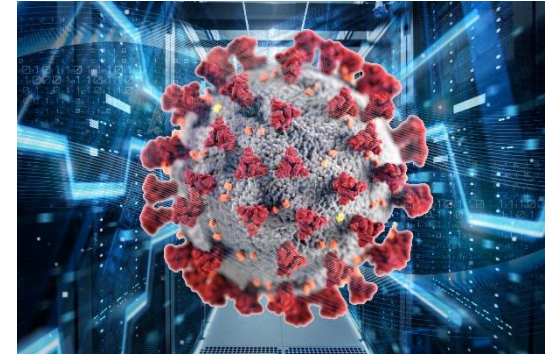
credits – Jamie Hall (ILL) + Stuart Caunt (ILL)

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ExPaNDS
European Open Science Cloud Photon
and Neutron Data Services

PaNOSC and ExPaNDS will provide by 2022

- ✓ **Data policy framework**
- ✓ **Persistent identifiers (DOIs) for data**
- ✓ **Data management plans**
- ✓ **Standard metadata**
- ✓ **Nexus/HDF5**
- ✓ **Electronic logbooks**
- ✓ **Open data**
- ✓ **Data search API**

- ✓ **Data portal**
- ✓ **Jupyter notebook service**
- ✓ **Remote access desktops**
- ✓ **Data simulation services**
- ✓ **Data transfer service**
- ✓ **Persistent user identities (AAI)**
- ✓ **Scientific software catalogue**
- ✓ **e-training platform + material**

For enabling Open Data + Open Science

panosc

ExPaNDS
European Open Science Cloud Photon
and Neutron Data Services

Mid-term achievements of PaNOSC/ExPaNDS

- Enhancing the PaN software catalogue
- Designed and developing search data catalogue search API
- Simulation software APIs released
- Developed python MacStasScript for McStas, integrated in pan-learning
- Deployed e-learning platform pan-learning.org supports PaNOSC AAI
- 2 EOSC services published
- Support for HDF5 + NeXus
- Developing PaNOSC portal
- AAI integrated into eduTEAMS
- Deployed Jupyter at all partner sites

and also

- FAIR research data policy framework
- Working on DMP templates
- Open call for Use Cases from scientists
- Provided publications and feedback to EOSC Working Groups
- Organised with ExPaNDS the PaN EOSC symposium
  - 199 participants, 09/11/2020
- Many videos promoting Open Science and data management practices

May 20, 2020

Project deliverable Open Access

1,022 views   670 downloads

PaNOSC FAIR Research Data Policy framework

Gotz, Andy; Perrin, Jean-Francois; Fangohr, Hans; Salvat, Daniel; Gliksohn, Florian; Markvardsen, Anders; McBirnie, Abigail; Gonzalez-Beltran, Alejandra; Taylor,Jonathan; Matthews, Brian

This paper presents the new photon and neutron research data policy framework based on the previous PaNData policy (https://doi.org/10.5281/zenodo.3738497) applicable to all photon and neutron facilities and scientific research data in general. The data policy framework is strongly aligned with the FAIR principles. The aim of the policy is to ensure that the FAIR principles are applied in research data policies. This deliverable has been prepared by the EOSC projects PaNOSC (https://panosc.eu) and ExPaNDS (https://expands.eu) together to ensure harmonisation of the updated data policies for the photon and neutron communities.

Video promoting DOIs + contacted publishers together LEAPS + LENS

Sustainability of PaNOSC/ExPaNDS

Services to be sustained after the projects:

- AAI

- Data transfer service (RI-RI, RI-HPC-centre, RI-User)

- Helpdesk

- Data catalogue search engine + API

- Software catalogue

- Data visualization service

- Jupyter notebook services + data analysis as a service (DAaaS)

- Simulation services

- E-learning platform

PaN RIs in PaNOSC/ExPaNDS are coming together in LEAPS & LENS

Photons
(LEAPS – League of European Accelerator based Photon Sources)

PaNOSC
ExPaNDS
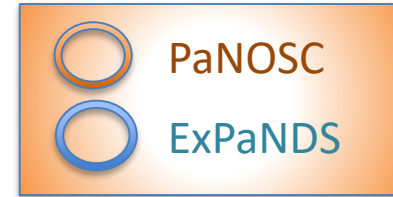
DESY
CESNET
STFC

Neutrons
(LENS – League of European Neutron Sources)

These projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreements No. 823852 and 857641

Sustainability of PaNOSC/ExPaNDS via LEAPS & LENS

✓ LEAPS & LENS via the RIs in these leagues will share the future sustainability of common services

✓ MoUs will define the cost and SLAs for each of the outputs from PaNOSC/ExPaNDS

Cross-Cluster activities today and future

- Ontologies – PaNOSC/ExPaNDS + EOSC-Life
- Data stewardship training – PaNOSC/ExPaNDS + EOSC-Life
- Jupyter HDF5 viewver – PaNOSC/ExPaNDS + ESCAPE
- VISA data analysis portal – all clusters and EOSC Future
- HDF5 file format best practices – all clusters
- Data transfer – PaNOSC/ExPaNDS + ESCAPE
- COVID-19 data – PaNOSC/ExPaNDS + EOSC-Life

TEAMWORK

panosc

ExPaNDS
European Open Science Cloud Photon
and Neutron Data Services

PaNOSC/ExPaNDS in EOSC-Future

- Integrate and exercise the services developed in PaNOSC/ExPaNDS into EOSC
- Apply them to two cross-disciplinary science projects
    - Tracing Bio-Structures
    - Dynamics of biological processes
- Collect feedback, improve services and make them generic, advertise and share results

Future role of Science Clusters

Science Clusters

- **Representing large and divers user communities**
- **Facing the data challenge – more data, more complex data**
- **Ensure that time to publication is reduced**
- **Provide an environment which is user friendly**

Desirable common activities

- **Cloud procurement of scale**
- **Use of HPC, access models, accounting**
- **Workflow tools**
- **Data compression**
- **Machine Learning and Artificial Intelligence**
- **Best practices and knowledge exchange**
- **Share developments of common interest**
- **Fostering the Open Science paradigm**

"The scientific communities using the analytical facilities need an EOSC which enables seamless interaction with open data for open science"

Thank you to all PaNOSC/ExPaNDS project members for their contributions to the project and sharing a common vision!

andy.gotz@esrf.fr, patrick.fuhrmann@desy.de

Questions & Anwsers

Rudolf Dimper
PaNOSC Project Coordinator

Patrick Fuhrmann
ExPaNDS Project Coordinator

Social Sciences and Humanties Open Cloud

Realising the Social Sciences and Humanities part of the European Open Science Cloud

SSHOC

social sciences & humanities open cloud

Project: SSHOC — social sciences & humanities open cloud

Horizon 2020
European Union Funding
for Research & Innovation

Partners: 48
(23 beneficiaries + 25 LTPs)

SSH ESFRI Landmarks and Projects
& international SSH data infrastructures

Duration: 40 months
(January 2019 – 30 April 2022)

Project budget:
€ 14,455,594.08

Type of action & funding:
Research and Innovation action
(INFRAEOSC-04-2018)

Project website:
www.SSHOpenCloud.eu

Objectives:

- creating the social sciences and humanities **(SSH)** part of European Open Science Cloud **(EOSC)**
- maximising **re-use** through **Open Science** and **FAIR** principles (standards, common catalogue, access control, semantic techniques, training)
- interconnecting existing and new infrastructures (clustered cloud infrastructure)
- establishing appropriate **governance model** for SSH-EOSC

SSHOC Partners

ESFRI Landmarks + projects: cessda, DARIAH-EU, CLARIN, European Social Survey, SHARE - Survey of Health, Ageing and Retirement in Europe, E-RIHS European Research Infrastructure for Heritage Science *

Stakeholder engagement & dissemination: LIBER, Trust-IT Services - Communicating ICT to markets

Research Communities: University of York, SciencesPo, Koninklijke Nederlandse Akademie van Wetenschappen, cnrs, Consiglio Nazionale delle Ricerche, University of Nottingham UK | CHINA | MALAYSIA, Tilburg University, THE NATIONAL GALLERY, UCL

Technology providers: FORTH Institute of Computer Science, SEMANTIC WEB COMPANY, CentERdata

*E-RIHS is not a legal partner in the SSHOC project but we connect to the E-RIHS community through the Institutum Archaeologicum Germanicum.

SSHOC
social sciences & humanities open cloud

ESFRI domain distribution

Social Sciences
Humanities

Tools & Services after SSHOC – ca. 40
potential cross-domain functionality

- Tools & Services
  - Virtual collection manager – for composing combinations of tools & data
  - Metadata conversion between (SSH) standards
  - Aioli Platform for documenting and annotating cultural heritage artefacts
  - SSHOC Trust Support (for certification of EC trusted repositories)

- SSH Open Marketplace
  - The Social Sciences and Humanities' gateway to EOSC

- Training
  - Training Discovery Toolkit
  - Directory of Trainers

- Website
  - Entrypoint to EOSC

SSHOC
social sciences & humanities open cloud

Potential Collaboration Activities
Pillar A & B – from SSHOC perspective

Pillar A: Inter-Cluster common data services co-developments

- Technical
  - Processing of sensitive data in the cloud
  - AAI, incl. CESSDA-INSTRUCT Science Project in EOSC Future
  - FAIR testing tools (e.g. F-UJI in FAIRsFAIR)
  - Data Citation (Scholix, connecting publications and data – and software)
- Virtual Research Environments (how to set up VRE's)
  - Remote access solutions
  - EOSC Future for pilots/pathfinders through Science Projects
- Training with certification
  - Directory of Trainers

SSHOC
social sciences & humanities open cloud

Potential Collaboration Activities
Pillar A & B – from SSHOC perspective

Pillar B: Delivery Content to EOSC with Science Projects

- Data Spaces (focus on content, not technology)
  - COVID – Infectious Diseases, e.g. BY-COVID (submitted) Use Cases (Life & Social)
  - Ecosystems (bio, eco, …)
  - Cultural Heritage (Humanities-PaNOSC)
  - Democracy: Linked Open Data & Knowledge Graph
- Co-creation
  - International organisations (DDI, RDA, ARDC (Australia), OECD, …)
  - GAIA-X partners on specific themes
  - Citizens

SSHOC
social sciences & humanities open cloud

EOSC Association & EC

- How to position in EOSC Association
  - HE Work Programme on Research Infrastructures
  - Working Groups
  - General Assembly
- Towards ESFRI, ERIC-Forum, other umbrella organisations
- EC RTD and CNECT

SSHOC
social sciences & humanities open cloud

SSHOC Key Exploitable Results

Switchboard
Connecting data & tools

Virtual Collection Registry
Your tools & data playlist

Aïoli-platform
3D-annotation of artefacts

Web Sample Management System
for cross-national surveys and panels

SSH Conversion Hub
Metadata conversion services between the most relevant metadata formats

SSH Open Ontology
Semantic interoperability framework for the description of the SSH data lifecycle

ARIADNE-plus
Improving archaeological data management

Automatic Verification Tool
Verify translations of survey questions

Knowledge Graphs in Electoral Studies
Connecting structured and unstructured data

Ethnic and Migrant Minority Survey Registry
Search 800+ surveys from 30+ EU countries

SSH Open Training Toolkit
A curated registry of training resources

Training Directory

SSH Open Marketplace
SSH Open Marketplace BETA
Social Sciences and Humanities Open Marketplace

Data Management
Processing & Analysis
Training
Datasets

Multi-disciplinary
SSH

SSHOC
social sciences & humanities open cloud

Thank you for your attention!

Join our community

https://www.sshopencloud.eu

info@sshopencloud.eu

@SSHOpenCloud

/in/sshopencloud

Ron Dekker
SSHOC Project Coordinator

Carsten Thiel
SSHOC

ESFRI SCIENCE CLUSTERS

POSITION
STATEMENT

ON EXPECTATIONS AND LONG-TERM
COMMITMENT IN OPEN SCIENCE

JUNE 2021

ENVRI
FAIR

EOSC-Life

ESCAPE

panosc
photon and neutron
open science cloud

SSHOC
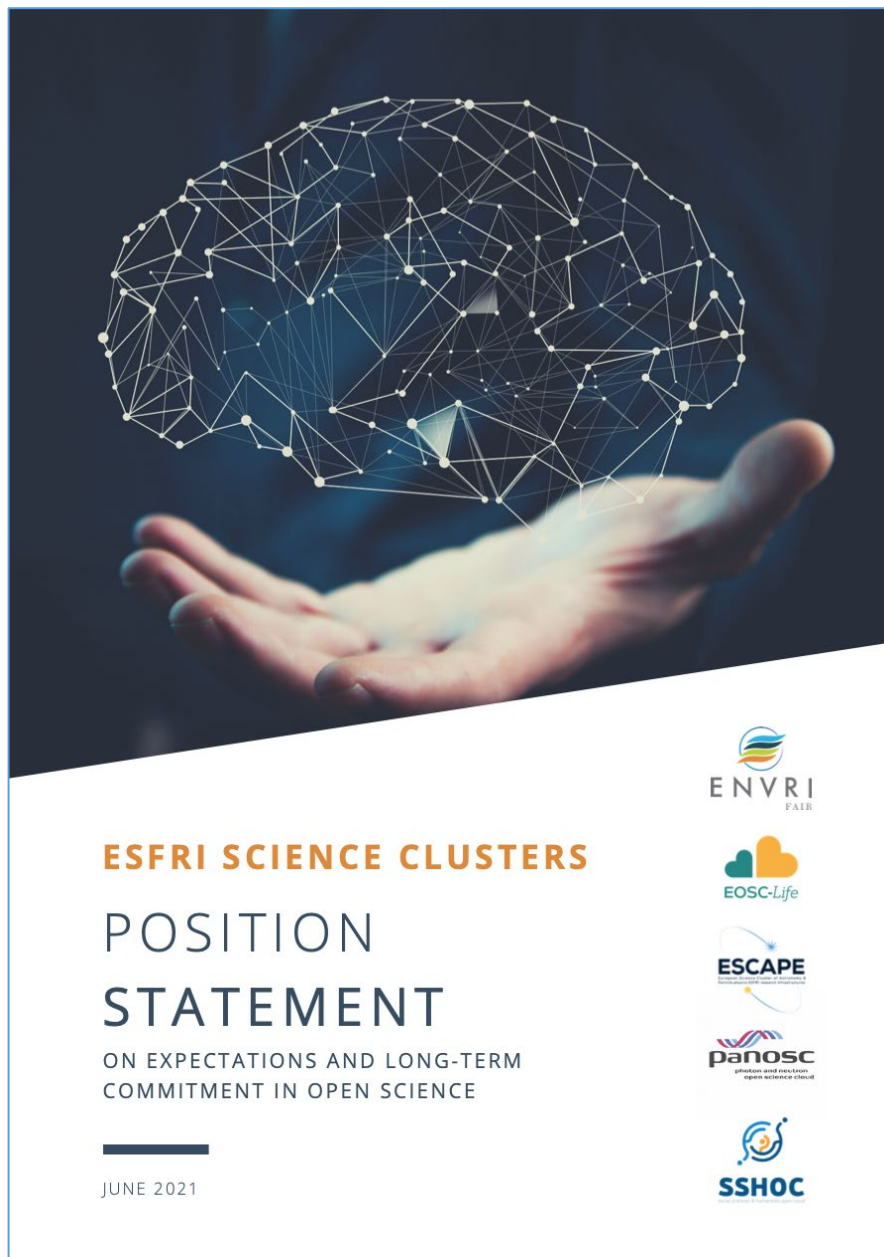
| AUTHORS

PAGE | 02

ENVRI-FAIR - Andreas Petzold (Forschungszentrum Jülich), Ari Asmi (University of Helsinki) and Magdalena Brus (ICOS ERIC)
EOSC-Life - Niklas Blomberg (ELIXIR) and Michael Raess (INFRAFRONTIER)
ESCAPE - Giovanni Lamanna (CNRS-IN2P3/LAPP) and Ian Bird (CNRS-IN2P3/LAPP)
PaNOSC - Rudolf Dimper (ESRF) and Andrew Götz (ESRF)
SSHOC - Ron Dekker (CESSDA)

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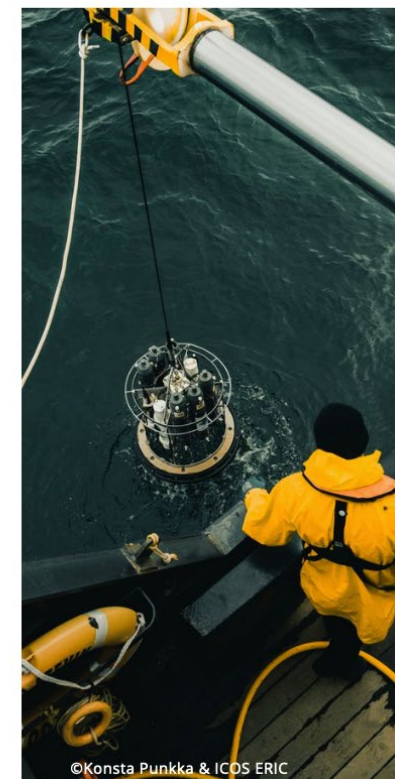
©Konsta Punkka & ICOS ERIC

Data: any digital object (including software, algorithms, analysis services, workflows, ..)

Virtual Research Environment (VRE): thematic collaborative digital environment used by scientists, which enables FAIR community-based scientific research, training, innovation, cross-fertilisation and open science (... *vs* the idea of a "marketplace")

EOSC Association: established as a legal entity on 29th July 2020 aimed at bringing together all relevant stakeholders to co-design and deploy a <u>European Research Data Commons</u> where <u>data are FAIR</u>, and also as open as possible.

SRIA: Strategic Research and Innovation Agenda (SRIA) of the European Open Science Cloud (EOSC)
(https://www.eosc.eu/sites/default/files/EOSC-SRIA-V1.0_15Feb2021.pdf)

European Data Spaces: "...The European strategy for data aims at creating a single market for data that will ensure Europe's global competitiveness and data sovereignty. Common European data spaces will ensure that more data becomes available for use in the economy and society, while keeping companies and individuals who generate the data in control.
Data is an essential resource for economic growth, competitiveness, innovation, job creation and societal progress in general..."
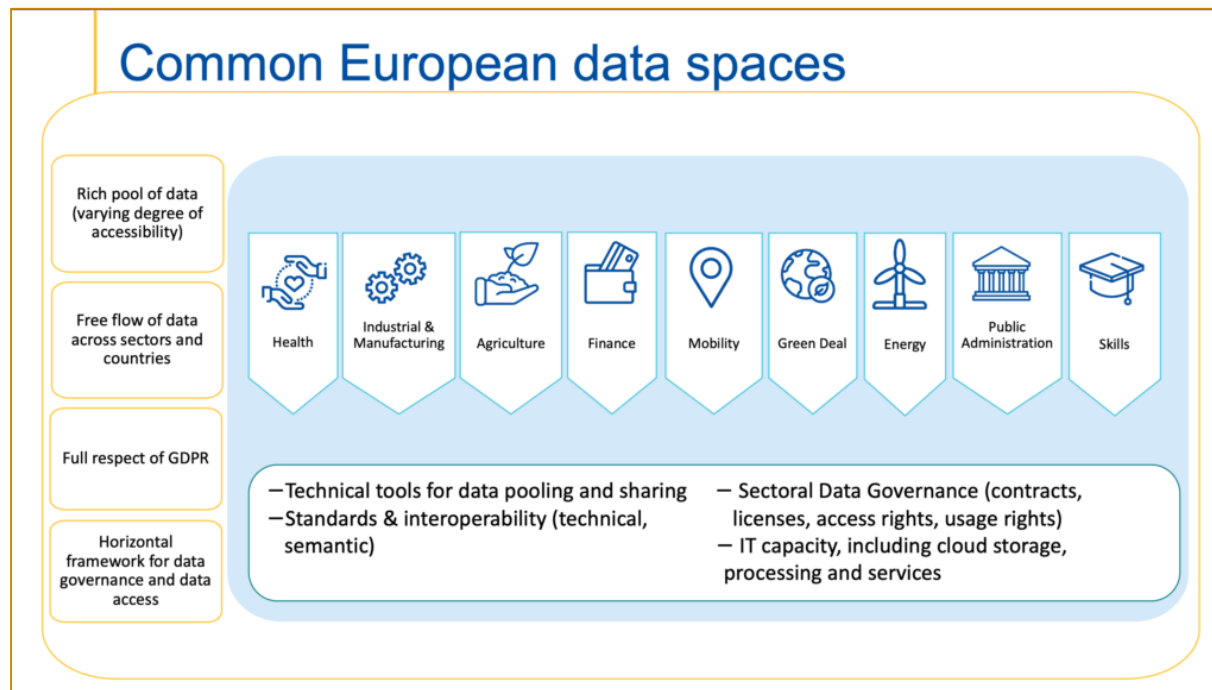
Preamble

Science Clusters (lessons learned and in progress):

- one of the EC's most effective and innovative network tools (we need to pursue the successful and effective cooperative approach);

- Science Cluster sustainability is a question addressed to the RIs and communities, while the sustainability of EOSC (for science) depends on the maturity of our VREs and a set of a few of our core services.

Science Clusters in the European research and innovation landscape

Position I: General Role and positioning of Science Clusters

- **The Science Clusters are engines for Interdisciplinarity.**

Their cross-fertilization environment has bridged sociological and technical barriers.
The Science Clusters have potential to shape the future <u>EOSC agenda and the Horizon-Europe framework</u> evolution as well as <u>operationalising the European Research Area</u> (ERA).

- **The Science Clusters occupy a unique position between EOSC, ESFRI RIs and scientific communities.**

<u>Three momenta</u> mark the success of the **Science Clusters** -> We all want to keep on them for the future.

Top-Down: The **(ESFRI) RIs** legal entities → joining efforts together

Bottom-Up: The **concerned scientists** → willing to pursue the cross-fertilization in science and innovation

Horizontally: The Universities and Institutes → leveraging the inter-domain potential... to be fully exploited around new academic/training schemes based on data-research

Science Clusters in the European research and innovation landscape

Position II: Science Clusters in EOSC and Open Science landscape

- **The Science Clusters uniquely capable to address the challenges of open research data being at the same time data producers and consumers**.

- **The Science Clusters are a key part in developing mid-level multidisciplinary tools and platforms.**

- **The Science Clusters' track record of integrating infrastructures can be a significant asset for the EOSC.** The majority of the EOSC Association members are EU member States Universities and Research Institutes: science and the support of research communities as the EOSC major aim!

It is of primary importance that the EOSC implementation roadmap, as well as its governance, make reference to domain-based scientific communities and to the Science Clusters supported by them.

Science Clusters in the European research and innovation landscape

Position III: Science Clusters in scientific and RI communities

– An infrastructure of "Web of FAIR Data and Services for Science" risks to be incomplete and ineffective without "community-governed" open-science commons platforms co-developed and operated by scientists (VRE vs Marketplace).

– **The Science Clusters build and maintain key community-centred initiatives.** The five Science Clusters have recently committed to co-steer shared actions to engage more researchers in the EOSC and in cooperation with pan-European e-infrastructure organizations in the H2020 EOSC-Future project.
(i) Supporting consolidation actions; (ii) building multi-domain Science Projects (SPs);
(iii) making the EOSC a federation of VREs for the sustainability of EOSC.

– **The Science Clusters also provide a rapid and efficient platform for joining the RI services within or even cross clusters for important societal challenges**. Recent COVID-19 projects demonstrate rapid response and capability for science-based societal and economic resilience in Europe.
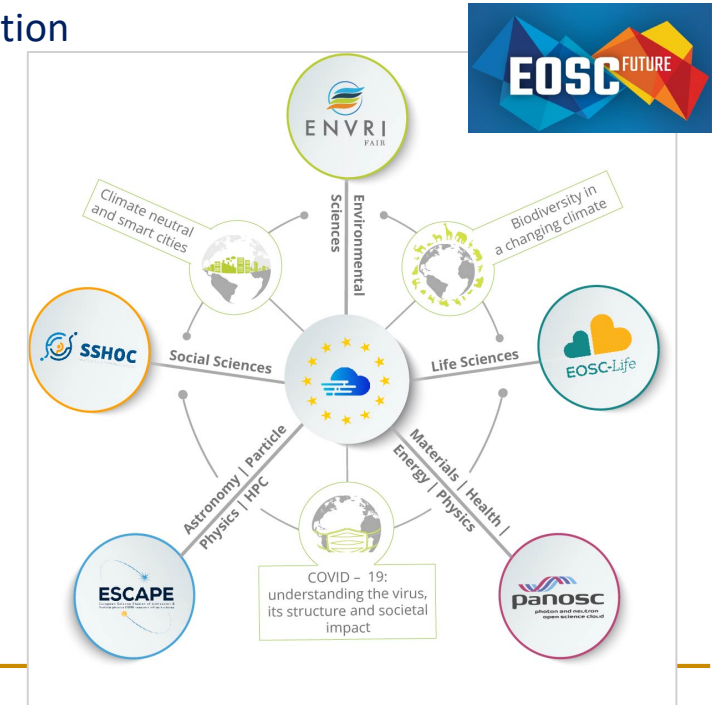
Common statements of the five Science Clusters

The **Science Clusters** are willing to <u>operate</u> and <u>adapt</u> their thematic open-science resources in EOSC towards four urgent needs:

1. making science always central, solid and inclusive of its social and cultural dimension, as collective knowledge to be nurtured;

2. leveraging crosscutting and cluster cross-domain projects connected with European sectoral data spaces;

3. providing training, committing to education and engaging citizens in science;

4. exploring the way to translate their excellence in data-research into economic value.

Clusters as "platforms"

Science Clusters would continue to evolve, driven by the scientific need.

- **"Platform" infrastructure** refers to the potential long term (further than the H2020 Grants' duration) mission/structure of a cluster to develop, operate and exploit its community-based VRE, combining the RIs steering with the national Univ./Institutes consortia participation.

- The platforms, internally and collectively, will study, define and set up a series of new task forces. They will also structure their commitment to Horizon Europe

A work plan for the future of the Science Clusters

Supporting the "EOSC Association mandate" and the European Commission

While many Science Clusters' partners are members of the EOSC Association, and in the EOSC governance, the Science Cluster would bring in addition the collective scientific community expectations.
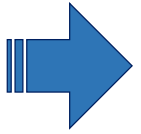
The Science Clusters would propose to link directly to the **EOSC Association Board of Directors**, supporting it in the evolution of the EOSC roadmap.

A work plan for the future of the Science Clusters

There is a prompt need and opportunity to support the Science Clusters further (in 2022-2025) within **Horizon Europe framework**

Science Cluster GO

| H2020 Cluster projects | EOSC-Future | Science Cluster SO | Science Cluster OO |

| 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |

EOSC-SRIA   *Stage2*   *Stage3*
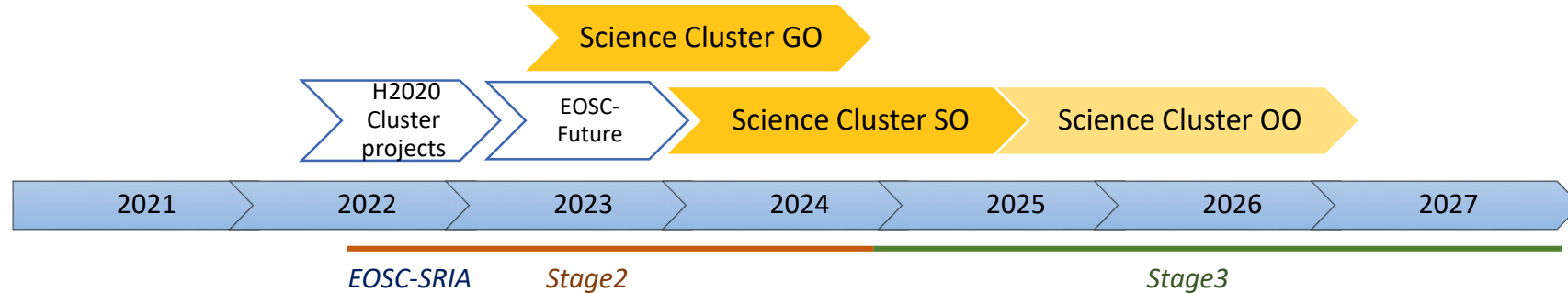
H2020 and potential **Horizon Europe** funded actions (*aligned with the EOSC-SRIA Stage2 -to- Stage3*)

General Objectives (**GO**):
- consolidation of thematic data infrastructures (cluster VREs, platforms and a "few core services") as parts of a federation.

Specific Objectives (**SO**):
- relevant scientific results from clusters;
- increased number of RIs;
- enhance researchers uptake of OS and widening dimension.

Operational Objectives (**OO**):
- sustainable operation of the deployed cluster as a "platform infrastructure";
- continuous promotion, extension and hosting of inter-domain FAIR Science Projects (new Open Science Objectives).

Proposing two major approaches (Pillar A & B) in the Horizon Europe framework:

Pillar A - Inter-cluster common data services co-developments
(from **GO** to **SO**)

I.   The sustainability of the five clusters is built through the structuring of their wide cooperative VRE intended as the implementation goal for an effective and successful operation of EOSC. <u>VREs need to become fully operative.</u>

II. Some of the most successful achievements of the Science Clusters are the key data services within EOSC for "data provision, discovery, and exploitation", e.g. catalogues, analysis frameworks, FAIR data archives, solving research communities/themes challenges. <u>Envisaging inter-cluster projects is also relevant for interoperability and commons.</u>

III. Consolidating a "<u>few core services</u>" per cluster to become part of the EOSC sustainable core services.

Pillar B - Delivering Content to EOSC
(from **SO** to **OO**)

The next step (starting from 2023) in the Science Cluster agendas will be to uptake emerging and concrete "Open Science Objectives"; further than the current (test) Science Projects in EOSC-Future.

A 'matrix' based on 'two methods'…

- **Open Science Projects (OSP)**
  - to continue bridging barriers to open science within a large scientific community;
  - to leverage the pan-European cluster action towards more global commitments as well as regional initiatives[*].

- **Cross-Cluster Open Science Projects (COSP)**
  - are envisaged to be tackled by focusing on topical aspects within one cluster supported by complementary contributions from all clusters;
  - to leverage the inter-cluster coordination for the regional initiatives[*] emerging from OSP.

Pillar B - Delivering Content to EOSC
(from **SO** to **OO**)

.. And along a series of 'vertical' missions (laying in the capacity of the ESFRI RIs partners):

- Wide innovation potential with industry (including SMEs).

- Affirmation and extension of a prominent Europe role more internationally.

- Structuring education and training-by-doing offers to facilitate work insertion of young generations as well as to participate in the European resilience plan.

- Supporting 'Science & Technology Policy for Society' as well as 'data/cloud business capacities' (e.g. by engaging with GAIA-X).
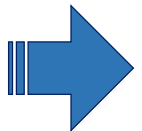
The Science Clusters would explore how to commit with EC for European Data Spaces [...]

Examples ?

…with (in some cases) an 'ESCAPE' filter, to demonstrate that is possible even for the most distant science domain (for an external observer…) to be concerned by Data Spaces prospective.

ESFRI facilities in PaNOSC and ESCAPE to support EU's industry; as well as global coordination for innovation, e.g. Quantum Computing as a service and for tech. R&D; algorithms and standards for Industry 4.0; AI; HPC.

Industrial & Manufacturing

Aligned with ENVRI-Fair data as well as to use the major potential of data of all other Clusters in support of circular economy, RIs construction and geo./environment implications […]
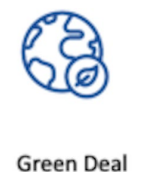
Green Deal

A series of actions by SSHOC, but also data to improve accountability of public spending for research; management and sustainability of Big Science RIs through socio-economic impact model analyses.

Public Administration Finance

Health data essential for EOSC-Life advances but also link with nuclear et al. facilities for preventing/treating diseases

Health

Energy

Cross-sector sharing of data for an unifying, forward-looking approach of any Big Science facility for energy efficiency, water management, etc.

Skills

Science Data to reduce the skills mismatches between the education and training systems and the labour market needs.

European Strategy for Data

A common European data space, a single market for data

Data can flow within the EU and across sectors

Availability of high quality data to create and innovate

European rules and values are fully respected

Rules for access and use of data are fair, practical and clear & clear data governance mechanisms are in place

European Commission

Conclusions

Science Clusters position statement is about:

Expectation:

Accelerate the discoveries and increase scientific value

Enable opportunities offered by the digital revolution

Commitment:

Shape and operate platforms for data interoperability

Sustain the federation of RIs for excellence science

Widen impacts of Open (Data) Science

Cooperation:

EOSC Association and EC

Inter-domain and cross-disciplines

SMEs for co-developments

Society at large

Inclusiveness:

Attracting more thematic and emerging RIs

Lead a regional as well as international alliance in Science

Universities, Institutes and citizens

The EOSC Association: Advancing Open Science

Prof. Marialuisa Lavitrano

EOSC Association vice president
Email: info@eosc.eu

11th June 2021

ESFRI science clusters' workshop

EUROPEAN OPEN SCIENCE CLOUD

Where do we come from?

- The shared vision between the EC, MS&AC and a large community

- The decision of the governing bodies to institute a <u>Co-programmed Partnership</u> as the best instrument to collectively achieve this vision

EOSC Governance Model 2021-2027

The new governance model agreed with EU countries for the next EOSC implementation phase after 2020 will be tripartite including:

- The EU represented by the **Commission**

- The European research community represented by the **EOSC Association**

- EU countries and countries associated with Horizon Europe represented through a **Steering Board** to be set up in 2021 outside of the EOSC Association

European Commission

EOSC Association

Steering Board
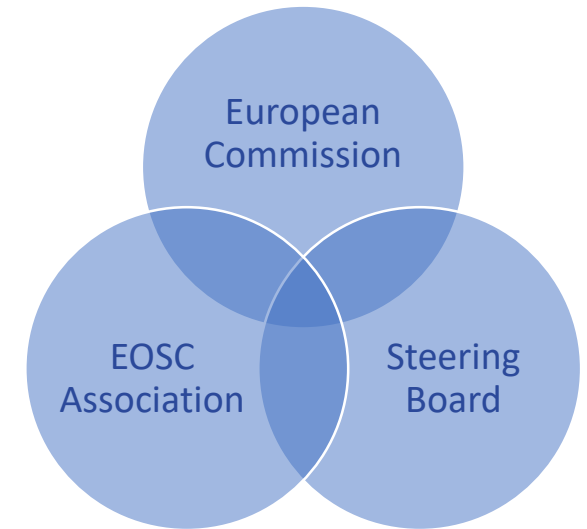
Joining the EOSC Association = Joining the EOSC Partnership!

The Vision

Building the EOSC ecosystem collaboratively with all stakeholders through the EOSC Partnership

Enable interdisciplinary research to address societal challenges

Support Open Science and contribute to the Digital Single Market

Offer EU researchers the digital resources they need to practise Open Science

Reduce fragmentation by federating existing research infrastructures

Stimulate the emergence of a competitive EU cloud sector

Develop a Web of FAIR Data and Services (including publications and software)

Give Europe a global lead in research data management

Priorities for EOSC implementation Stage 1 2021-2022

- Ensure that Open Science practices and skills are rewarded and taught, becoming the new normal

- Enable the definition of standards, and the development of tools and services, to allow researchers to find, access, reuse and combine results

- Establish a sustainable and federated infrastructure enabling open sharing of scientific results

EOSC-ecosystem objectives tree

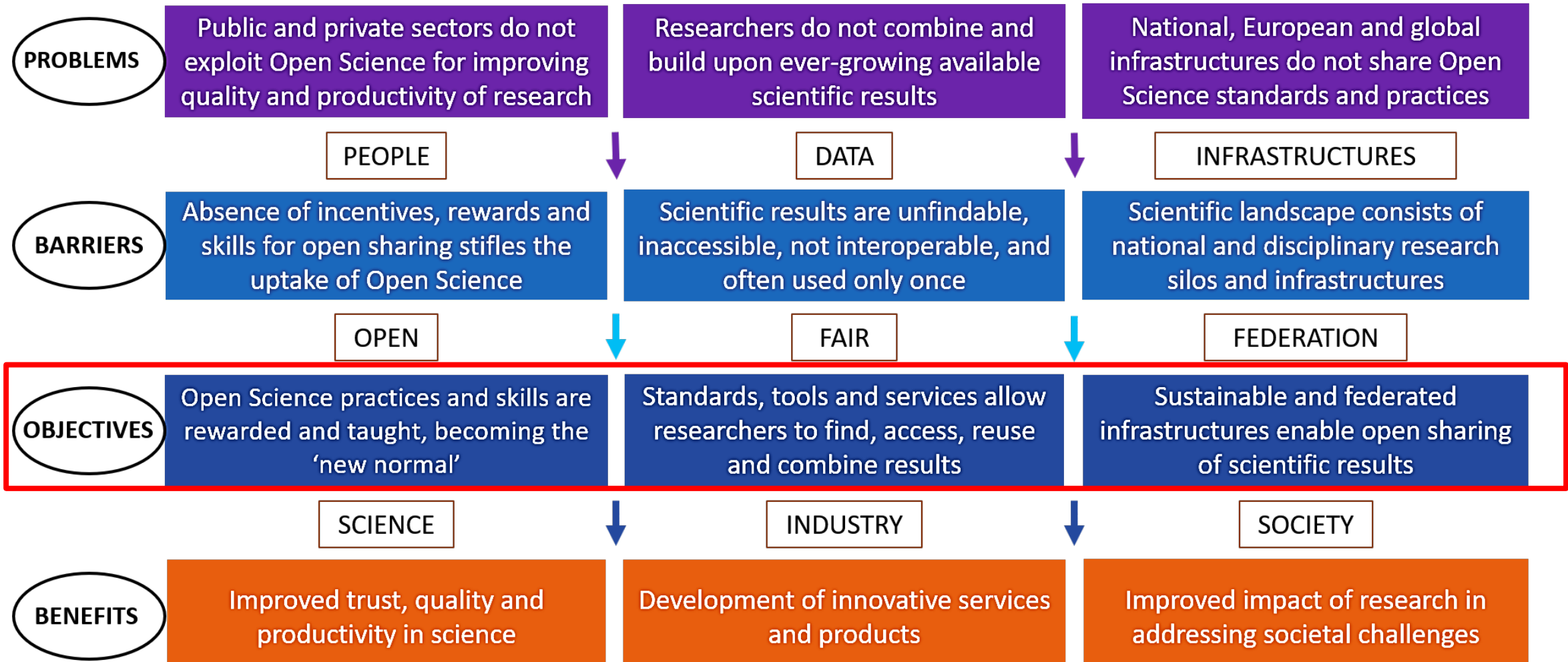| PROBLEMS	Public and private sectors do not exploit Open Science for improving quality and productivity of research	Researchers do not combine and build upon ever-growing available scientific results	National, European and global infrastructures do not share Open Science standards and practices
	PEOPLE	DATA	INFRASTRUCTURES
BARRIERS	Absence of incentives, rewards and skills for open sharing stifles the uptake of Open Science	Scientific results are unfindable, inaccessible, not interoperable, and often used only once	Scientific landscape consists of national and disciplinary research silos and infrastructures
	OPEN	FAIR	FEDERATION
OBJECTIVES	Open Science practices and skills are rewarded and taught, becoming the 'new normal'	Standards, tools and services allow researchers to find, access, reuse and combine results	Sustainable and federated infrastructures enable open sharing of scientific results
	SCIENCE	INDUSTRY	SOCIETY
BENEFITS	Improved trust, quality and productivity in science	Development of innovative services and products	Improved impact of research in addressing societal challenges

Guiding principles for EOSC

The overarching principle for developing EOSC is that research has to be at the centre of the EOSC initiative.

- **Multi-stakeholderism**
  EOSC will succeed if and only if it follows a multi-stakeholder approach;
- **Openness**
  EOSC will ensure research artefacts be 'as open as possible, as closed as necessary';
- **FAIR principles**
  EOSC research artefacts need to be findable, accessible, interoperable and reusable;
- **Federation of infrastructures**
  EOSC will federate existing and upcoming data- and e-infrastructures;
- **Machine-actionable**
  EOSC will strike the right balance between machines and people in delivering the services that will serve the needs of European scientists.

# Timeline of EOSC iterations towards a MVE
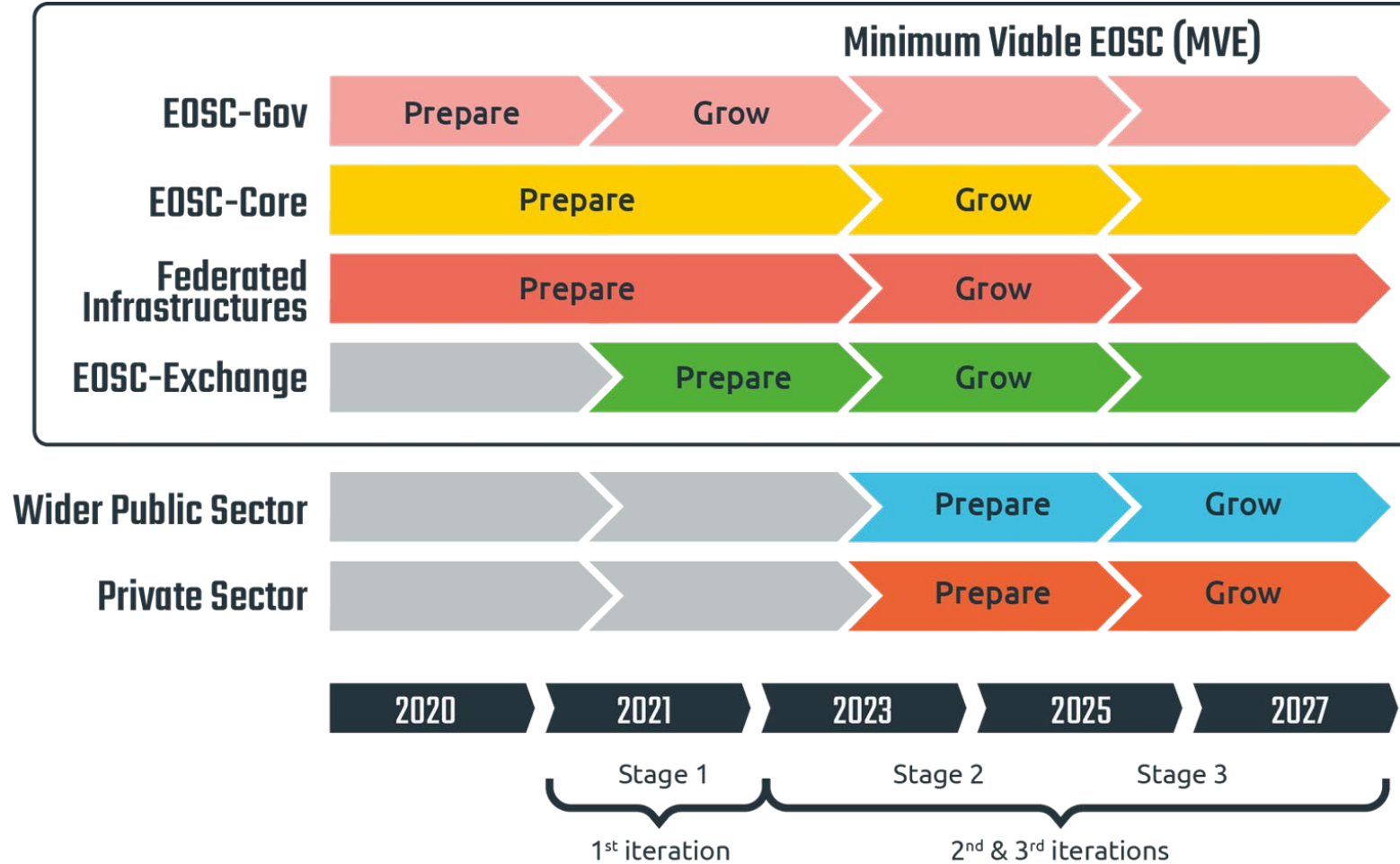
The EOSC Association

- Four founding members (CESAER, GEANT, GARR, CSIC)

- Was started as AISBL* on Wednesday 29th July 2020

- Obtained Royal Decree on Friday 11th September 2020

- First General Assembly on 17-12-2020 elected President and Board

- Research Performing; Research Funding and Service Proving organisations

- Now 153 members and 63 observers (62% - 8% - 30%) (April 2021)

- A European Co-programmed Partnership, between the EC and the EOSC Association, MoU to be signed 23 June 2021

Joining the EOSC Association = Joining the EOSC Partnership! *International not-for-profit association under Belgian law

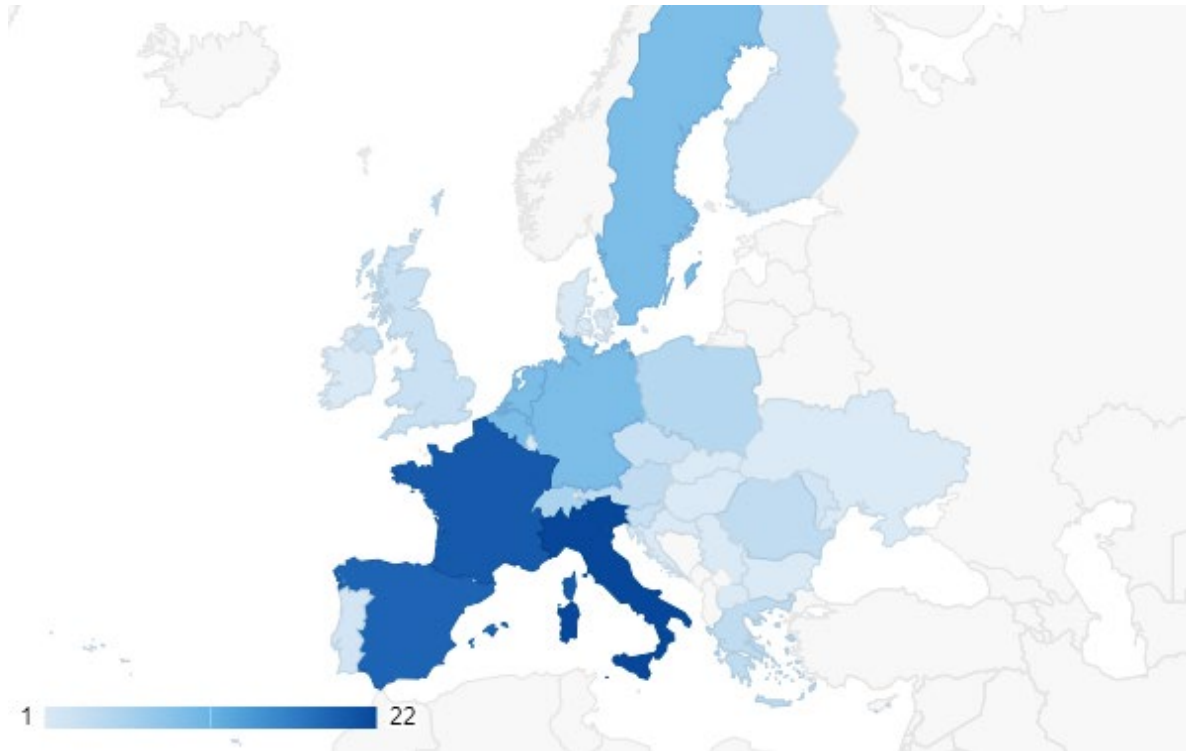# EOSC membership by status
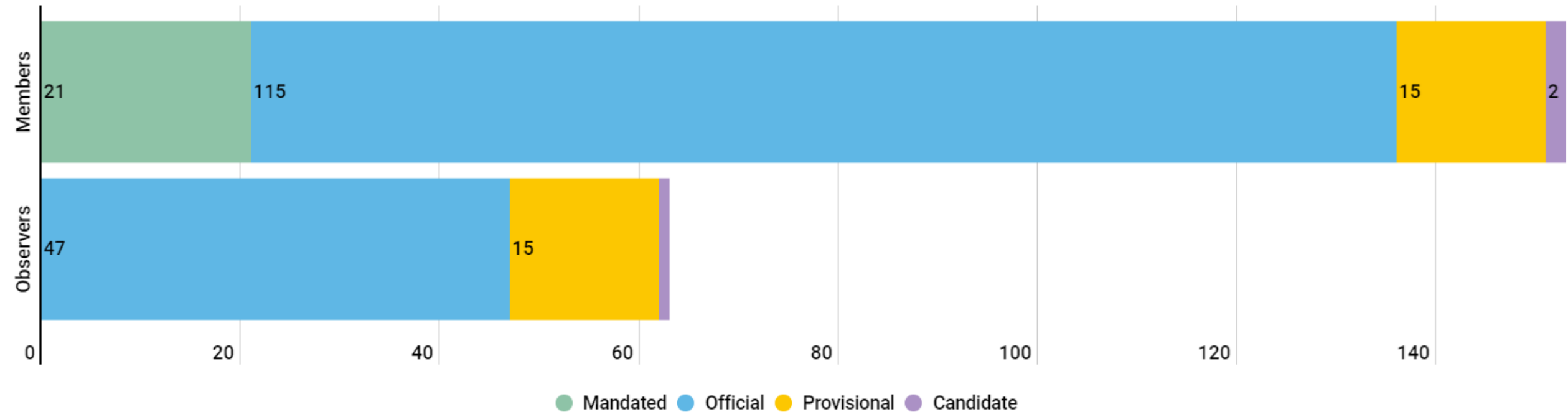
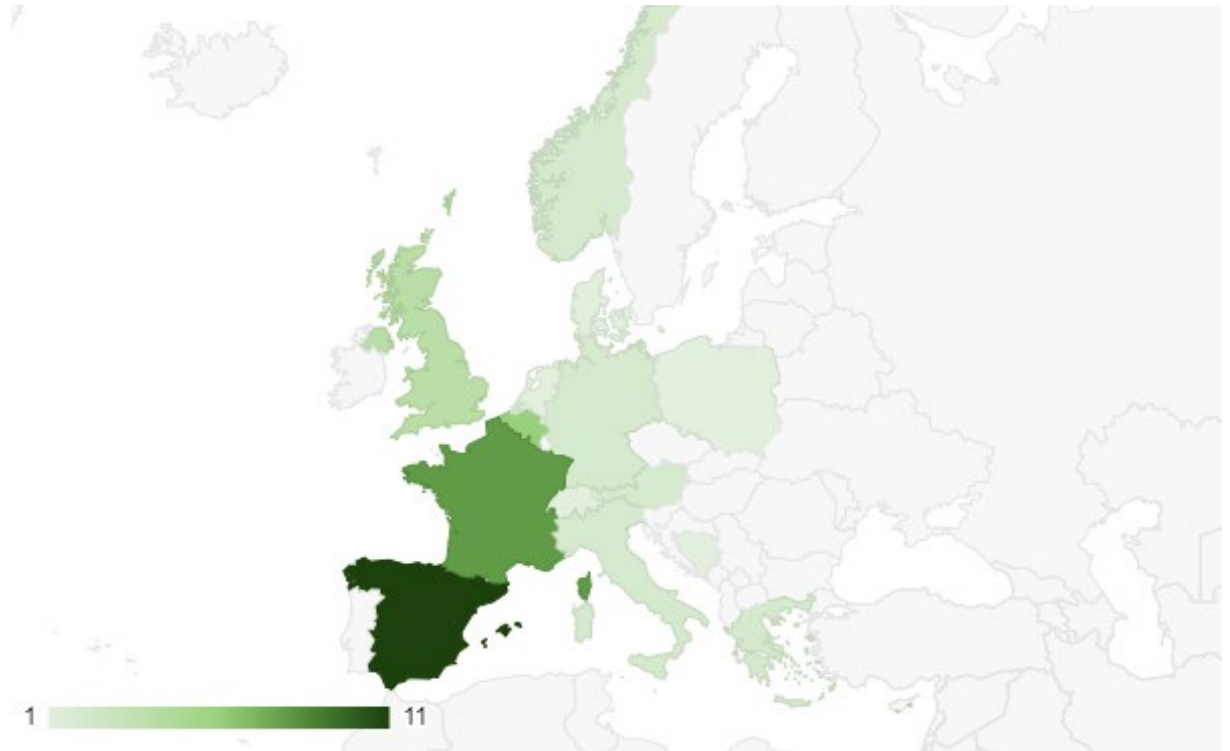**As of the end of April 2021**

Members: 153

Observers: 63

EOSC Association membership geographical spread
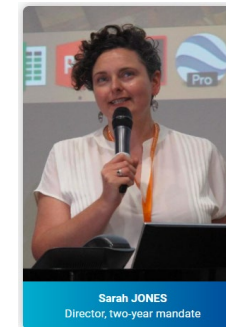
153 Members

~63 Observers

How to join the Association: https://www.eosc.eu/join-association

6/11/21

Board of Directors

- Karel Luyben, CESAER & President

- Klaus Tochtermann, ZBW & Director 3-year mandate

- Marialuisa Lavitrano, University Milano – Bicocca & Director 3-year mandate

- Suzanne Dumouchel, CNRS & Director 3-year mandate

- Sarah Jones, GÉANT & Director 2-year mandate

- Ignacio Blanquer, UPV & Director 2-year mandate

- Ronan Byrne, HEAnet & Director 1-year mandate

- Bob Jones, CERN & Director 1-year mandate

- Wilhelm Widmark, University of Stockholm & Director 1-year mandate

Karel LUYBEN
President

Marialuisa LAVITRANO
Director, three-year mandate

Suzanne DUMOUCHEL
Director, three-year mandate

Klaus TOCHTERMANN
Director, three-year mandate

Sarah JONES
Director, two-year mandate

Ignacio BLANQUER
Director, two-year mandate

Bob JONES
Director, one-year mandate

Wilhelm WIDMARK
Director, one-year mandate

Ronan BYRNE
Director, one-year mandate

The EOSC Association

Mission: *Advancing Open Science to accelerate the creation of new knowledge, inspire education, spur innovation and promote accessibility and transparency*

- To provide a single voice for advocacy and representation for the broader EOSC stakeholder community.

- To promote the alignment of European Union research policy and priorities with activities coordinated by the Association.

- To enable seamless access to data through interoperable services that address the entire research data life cycle, from discovery to storage, management, analysis and re-use across borders and scientific disciplines

What are the EOSC Advisory Groups / Task Forces

- A structure to allow Association members and others to help steer the implementation of EOSC

- Groups should liaise with EOSC projects and offer feedback and advice

- Identify strategic gaps and areas for investment to input to SRIA

- EOSC Association members can propose and lead groups. Externals can also be members

- Task Forces are groups within the AGs who undertake activities to implement certain aspects of EOSC according to their topic

Task Force topics

Implementation of EOSC

- Rules of Participation compliance monitoring

- PID policy and implementation

- Researcher engagement and adoption

Technical challenges on EOSC

- Technical interoperability of data and services

- Infrastructure for quality research software

- AAI Architecture

Metadata and data quality

- Semantic interoperability

- FAIR metrics and data quality

Research careers and curricula

- Data stewardship curricula and career paths

- Research careers, recognition and credit

- Upskilling countries to engage in EOSC

Sustaining EOSC

- Defining funding models for EOSC

- Long-term data preservation

The role of science clusters in EOSC

- The science clusters (ENVRI-FAIR, EOSC-Life, ESCAPE, PaNOSC, SSHOC) are making major contributions to the EOSC as the key means of engaging research Infrastructures and their user communities

- The EOSC roadmap (SRIA version 1) foresees contributions from the science clusters that stretch beyond the lifetime of the science cluster projects

Science Clusters contributions to EOSC objectives

- Engage with researchers and promote the adoption of open science practices by research communities

- Participate in the definition of standards, and the development of tools and services that allow researchers to find, access, reuse and combine results

- Establish a sustainable and federated infrastructure enabling open sharing of scientific results

EOSC Symposium 2021

- EOSC Ecosystem explored

- Focus on AG topics and engagement with the community

- [Registration & Programme](#)

Any questions?

Thanks!

EOSC Association

EUROPEAN OPEN
SCIENCE CLOUD

Take Aways

We need science clusters that are fully integrated with EOSC and with their data FAIR by design, with emphasis on the "I".

Interoperability of relevant research data within each ESFRI Science Cluster would be great, interoperability between the ESFRI Science Clusters would be marvelous

Take Aways

ENVRI-FAIR empowers environmental sciences to interoperability and interdisciplinarity for reaching EOSC open science targets and responding to grand societal challenges.

EOSC-Life builds the operational processes that link up life science research outputs to the missions' objectives and the open data targets of EOSC.

ESCAPE brings the astronomy, particle and nuclear physics communities together to build next generation cross-domain facilities to answer fundamental questions about the Universe, and to bring our expertise on distributed Exabyte-scale data management and analysis to the benefit of the EOSC.
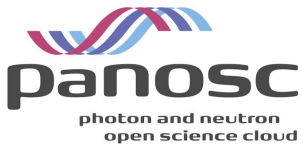
The scientific communities using the analytical facilities need an EOSC which enables seamless interaction with open data for open science.

The overall impact and end-result of SSHOC will be a Social Science and Humanities data ecosystem in which researchers and other interested parties have seamless access to high quality data.

Wrap-Up

- All involved RIs would like to see the Science Clusters pursuing their programmes and their cross-domain visions contributing to EOSC and more largely to Open Science in Europe.

  ⟹ **A plan to include this perspective in Horizon Europe framework was expected.**

- Continuous synergies with EC and EOSC Association is relevant.

  ⟹ **Cooperative link with the EOSC Association board is desired.**

- The European Data Spaces stimulate cross-disciplinary projects among the Science Clusters.

  ⟹ **More topical concertation (among clusters and RIs) and exploration (with EC) to plan.**

- This Workshop initiates a series of further occasions for periodical cross-border discussions.

  ⟹ **Openness and inclusiveness towards all partners and the scientific community at large to preserve.**

Thank you!